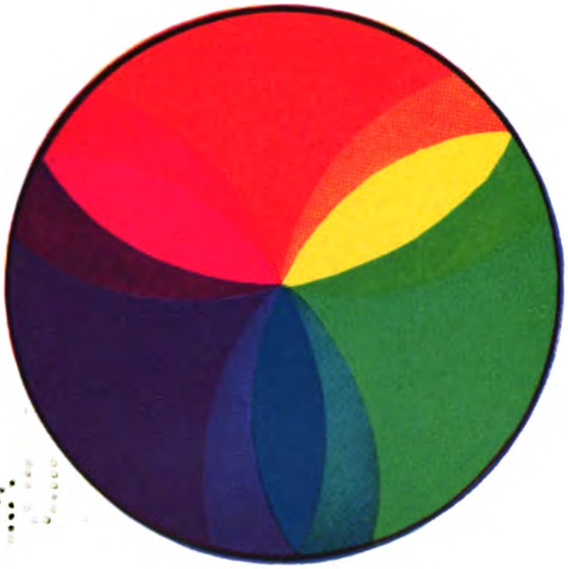

THE SPECTRUM PRIMARIES
are Red, Green, and Violet

THE PIGMENTARY PRIMARIES
are— Crimson
Yellow and
Blue

These are also the Secondaries of the Spectrum

COMPLEMENTARIES

| | |
|---|---|
| Red | Blue |
| Orange | Blue-Violet |
| Yellow | Violet |
| Yellow-Green | Purple |
| Green | Crimson |
| Blue-Green | Scarlet |

PLATE I

39015031567871

# THE STUDY OF COLOR

## WITH LESSONS AND EXERCISES

*Arranged for Instruction of Teachers,*
*Artists, Students and Parents*

BY

MICHEL JACOBS
DIRECTOR OF THE METROPOLITAN ART SCHOOL OF NEW YORK
AND METROPOLITAN COLOR GUILD OF NEW YORK

AUTHOR OF "THE ART OF COLOR"

---

***Sixteen illustrations in full color, ninety-two in black and white,***
***and eighty-six charts for coloring***

---

NEW YORK
D. VAN NOSTRAND COMPANY
EIGHT WARREN STREET
1925

ARCHITECTURAL
LIBRARY

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*Printed in the United States of America*

13.00

This little work I dedicate to those who've passed beyond;
Who helped me in my early days, with encouragement and praise:

MY BELOVED PARENTS
AND
STUDENTS

HELENE HENKEL

W. H. DEB. NELSON

ELWYN W. POOR

Now that the joy and pleasure's gone in their association I have still the pleasure of remembering.

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# INTRODUCTION

If the youth were taught the laws and theory of color in the same way as he is taught the laws and theory of music in the schools, the art of any country would be raised to a higher level.

This book is designed as a means of teaching the theory of color by progressive exercises as demonstrated in my first book, "The Art of Color." These exercises are so arranged that the student does the easy task first and gradually progresses until the designs become more advanced and complicated.

I have divided the book into three parts or sections which can be used for the first, second, and third year in the study of color. The student may do the entire work laid out in the book, or the instructor may omit any part without impairing the general instruction. The student will find that by doing these exercises the eyes become physically stronger to see color in nature, and things that were unnoticed in the past will hold an enhanced value when he sees the subtle colors with which Nature bedecks herself. The lessons will also correct false impressions and give a wider range of the possibilities of color combinations and compositions; and the color of shadows, which is always difficult to see, will automatically become discernible.

The theory of color used is based on the latest discoveries in the scientific and artistic world and is now used by many noted artists, designers, interior decorators, poster and costume designers, and for all the other fine and applied arts.

The standardization of colors and their names, hues, tones, shades, and tints, can be designated accurately by the use of the color-mixing charts which in itself will do away with the conflicting names so long in use. The terms of secondary and tri-cendary colors in the old sense have been discarded, as these are now known to be imperfect complementaries, or muddy color, and in their place gray or neutralized color substituted.

These exercises have been successfully used at the Metropolitan Art School of New York, and they have been found to hold the attention of the student and to keep that enthusiasm with which he first approaches the graphic arts. It is hoped, after he has studied and worked in these exercises, that work will be continued in the study of color, as it is a subject when once started will be a source of unending joy.

The charts numbered 1 to 86 are so arranged that they can be torn out of the book and inserted into a binder. These binders can be secured from the publishers or from the book stores at a moderate cost.

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# THE STUDY OF COLOR
## WITH LESSONS AND EXERCISES

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## CHAPTER I

"The difference between the artist and the scientist is that the artist is interested only in the rays of light which are visible to the human eye and the scientist is interested in the laws of light with all their invisible rays which he records with instruments; still, the principle of the law of nature is the same."

Sir Isaac Newton told us in 1667 that a beam of white light could be divided into three colors, and he called them red, yellow, and blue. The red that he mentions was a color which is known in this system as scarlet.

Later discoveries by Helmholtz in 1866 proved that the three primary colors of the spectrum are red, green, and violet, from which all other colors are made. These colors he particularly mentions are French vermilion, emerald green, and spectrum violet. By combining the red and the green rays of light we get a sensation in our eyes which we call yellow. By combining the green and the violet rays we get a sensation of blue, and by combining the violet and the red rays we get a sensation of crimson. You cannot mix the colors of the rays of light in the same way that you mix paints because if you mix

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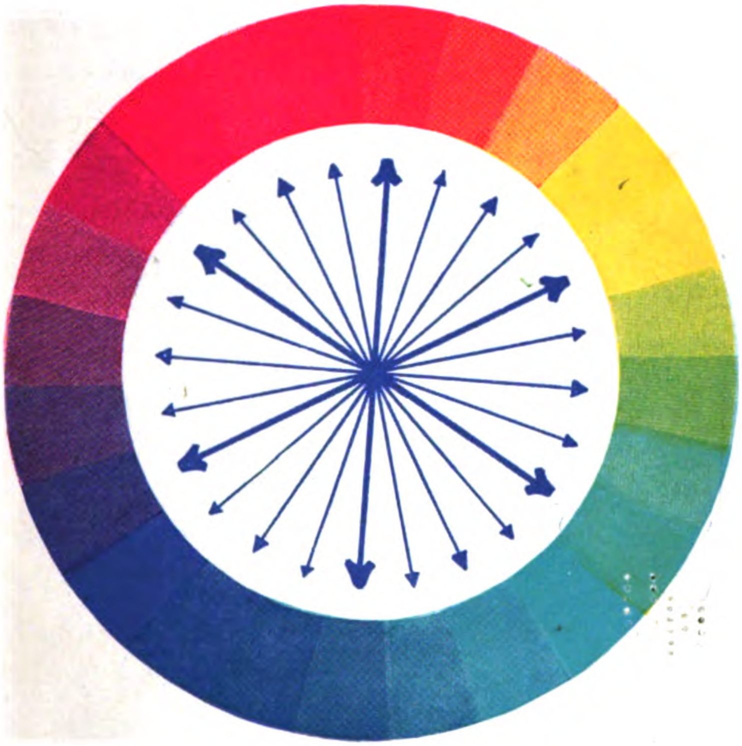
the three colors of the spectrum, red, green, and violet, with lights you make a white light, whereas, if you mix the three paints, red, green, and violet together you make a black paint.

In this system the law of light and the law of pigments are made to coincide; although it is the same law they work like everything else in nature—by the law of opposites.

The Law of Helmholtz is the law of direct light; the Law of Newton is the law of reflected light. If we changed the red of Newton, which is a scarlet, and made it crimson we could make both the Law of Newton and the Law of Helmholtz interchangeable. To repeat, if the three primary colors of light are thrown on to a screen at one time it will produce a white light; if the three primary colors are mixed together with paint it will produce black paint.

By using this knowledge we make up a spectrum circle and divide it in three equal parts, red, green, and violet, which we call the spectrum primaries, and in the alternate spaces between these colors, crimson, yellow, and blue, the true pigmentary primaries. In this way, one pigmentary primary will be opposite to the spectrum primary. It is very important for you to know the true complementary of each color so that you can mix these colors together, because if you do not mix the true complementary, your colors will not be pure and you will get muddy grays.

A combination of colors is also arrived at by the arrangement of the spectrum as illustrated (Plate I),



TWENTY-FOUR COLOR SPECTRUM

PLATE II

as by this arrangement harmonies, contrasts, and other combinations can be seen very quickly. These combinations are necessary to make beautiful designs for cloth or silk, or designs of any kind, and also for the making of beautiful portraits, landscapes, pottery, posters, and all works of art, even for the colors of dresses, or the decorating of our homes. There are a great many other uses to be made of this spectrum and the way it is arranged.

It must always be remembered that color is simply a reflection from some surface which has the power of sending back to our eyes one or more of the colored rays of light. We have all seen the rainbow or the beautiful colors that the sun casts on the floor or wall when the light goes through a beveled-glass window. If you look at this color band closely you will see distinctly the three colors of the spectrum and where they overlap the other three colors. Let us say that we see a piece of cloth which we call red. We remember that that particular red has the power to reflect the red ray of light only, and it will not reflect any of the other colors. You can try this by placing a red piece of cloth under a blue light or under a green light, and it will immediately look black because it cannot reflect any other ray of light but the red. If we take a violet article and place in a white light it looks violet, but if we place it under a red light it will not reflect, and looks black. If we take a yellow article and place it in a red light it will look red to us, and if we place it in a green light it will look green, and in a white light it will look yellow. This is because yellow can reflect both the red and the green light, and when both are reflected together it looks yellow, but if we place it in a violet light it will also look black because yellow cannot reflect anything but red and green, or yellow which of course is a combination of the red and green light together. Study the spectrum chart (Plate I) and memorize what colors are opposite to each other and you will understand that the colors that are so placed are called complementaries. A complementary color means that when two colors are mixed together with paint it would make a black or dark gray paint called neutral; and if two lights were thrown on a screen together it would look white. This, of course, is only in our eye because we have three sets of nerves which are sensitive only to red, green, and violet. When the red and the green are set in motion together we get a sensation of yellow, and when the green and the violet, we get a sensation of blue, and when the violet and the red, a sensation of crimson. To prove this, if you will take a bright red glass and place as a lantern slide in a magic lantern and shine it on a white sheet and look at it for about five minutes, getting your eye full of the red light, and then suddenly turn off the red light, you will see the exact shape on the screen—only instead of red you will see this in its complementary color blue—that is, of course, if the red is a vermilion or red of our spectrum chart (Plate I). If you take a green piece of glass—that is, emerald green—and throw this on the screen and quickly turn out the light you will get the same image in crimson. If you take a violet glass this after image, as it is called, will be yellow. If you take a yellow glass the after image will be violet. If you take a crimson glass the after image will be green. If you take a blue glass the after image will be red—so you see that the complementary colors can be worked either with the spectrum primaries or the pigmentary primaries.

# CHAPTER II

If we look at the spectrum chart again we find that a spectrum primary is complementary to a pigmentary primary, and a pigmentary primary is complementary to a spectrum primary, so we say that *any two primaries combined make a third primary complementary.* In other words, if we divide the spectrum in thirds and bring them together again they are called complementaries because when they mix together they make a black paint or a white light. We therefore arrive at the following rule: *To find out if a color is complementary mix the two together and if they form a perfectly neutral gray or black they are complementary.*

This is the only rule that we need to remember.

The object is knowing this is two-fold. First, if we wish to make a red paint which is not so brilliant as the pure spectrum color, we only have to mix a little of its complementary. This would neutralize the color a little, and if we added a little more of its complementary we neutralize it still more. This is the same as if we took a brilliant piece of cloth and showed it in a brilliant light—the color would look very brilliant, whereas if we showed it in a light which was not so brilliant the color would become neutralized or would not be able to show so brilliantly, and if put in a still darker place it would look still more neutralized, but it would always be the same color, simply different *shades or tones*. The second reason why we wish to know the complementary colors is: If we put the two complementary colors side by side, on account of the contrast they both look more brilliant.

The old idea that white reflected all colors and black absorbed them is a little misleading. It is true white has the power to reflect all rays of light. If we throw a white light on to a white cloth it will look white to us, and if we throw a red light on to a white cloth it will look red, and a blue light on to a white cloth will look blue, etc. This is because white has the power to reflect all the rays of light equally well, but if we throw a white light onto a black cloth, as it is not a good reflector, as is white, theoretically it will not reflect; but practically it will reflect a certain amount of the white light back to our eyes, depending on the kind of material which we use as the screen, because there is no such thing as a really imperfect reflector. The only place we can get a true black is in a dark room where there is no light at all, and then of course all colors including white look black because color is only a ray of light reflected back to our eyes, as so-called black paint is never black but always reflects some color, and therefore black paint would not lower the value perfectly as would the complementary of the color.

If we mix white paint to any color we give it the power to reflect other rays of light besides the color which it originally reflected, because white will reflect all colors equally well. For example, if we take a brilliant red paint and mix white with it, it has the power to reflect the other two rays of light. This makes the paint look lighter in value, and we call it a *tint*. Now if we take one of the colors which has been neutralized with its complementary, and add white, we make a tint of that shade of color. By mixing these colors as above directed and as is shown on Plate IV, you will find you have twelve colors mixed with their complementary, which gives four different shades or tones of that color, and by mixing white with those shades or tones we get four different tints of each of those shades, or, in other words, sixteen different values of each color. If we had a 24-color spectrum as is shown on Plate II, we could have many more tints and shades or tones.

It is the accepted custom to call the original color a hue. For example, red, orange, yellow, yellowgreen, green, bluegreen, blue, blueviolet, violet, purple, crimson, and scarlet are all hues, and if we mix a red with an orange we get an orange-red or red-orange, if we mix an orange with a yellow we get an orange-yellow or yellow-orange, and if we mix a yellow with a yellowgreen we get a yellowgreen-yellow or green-yellow. These are all called hues.

If we mix the complementary color with any one of these we get what we call shades or tones of that color.

If we mix white with any one of these shades or tones of color we get the tints.

By looking at Plate IV we see small letters and numbers at the side. Tints are lettered A, B, C, and D, and the shades or tones are numbered 0, 1, 2, 3, and 4. We notice that the brilliant color is both A and 0 whereas its first neutralization is 1A, its second neutralization 2A,

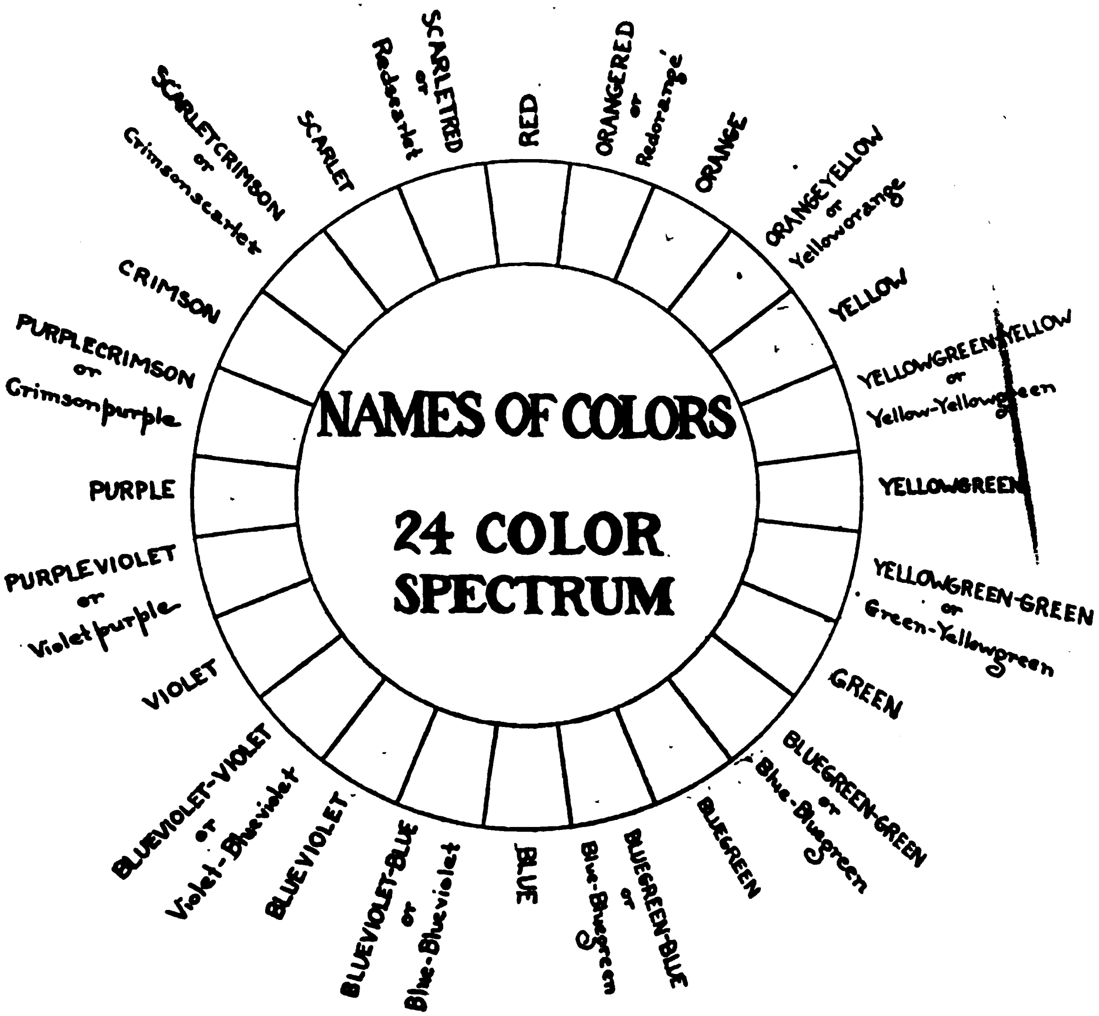

NAMES OF COLORS
24 COLOR SPECTRUM
RED
ORANGERED or Redorange
ORANGE
ORANGEYELLOW or Yelloworange
YELLOW
YELLOWGREEN-YELLOW or Yellow-Yellowgreen
YELLOWGREEN
YELLOWGREEN-GREEN or Green-Yellowgreen
GREEN
BLUEGREEN-GREEN or Blue-Bluegreen
BLUEGREEN
BLUEGREEN-BLUE or Blue-Bluegreen
BLUE
BLUEVIOLET-BLUE or Blue-Blueviolet
BLUEVIOLET
BLUEVIOLET-VIOLET or Violet-Blueviolet
VIOLET
PURPLEVIOLET or Violetpurple
PURPLE
PURPLECRIMSON or Crimsonpurple
CRIMSON
SCARLETCRIMSON or Crimsonscarlet
SCARLET
SCARLETRED or Redscarlet

PLATE III

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its third neutralization 3A, and the fourth neutralization 4A which is a dead neutral or black. We also notice that the 0A is the brilliant color and the 0B is the brilliant color with white added; or if we are painting with transparent water-colors we put less of the paint and more of the water, and the white of the paper shows through—this also gives us the tints. 0C is still lighter, and 0D is lighter still.

No. 1 shade or tone of a color without white added would be 1A; with some white, 1B; with more white, 1C; and with still more white, 1D. Shade or tone No. 2 with white added gives you all the tints in B, C, and D as likewise does No. 3 shade or tone.

By this method we can designate an exact shade or tone and an exact tint of a color. For example, if we said Red 0A it would mean a brilliant color; if we said Red 1A it would mean that color with less light on it, or neutralized color; if we said 1B it would mean that same shade or tone with white added, or a tint of that shade or tone. You see by this method you can designate any shade or tone or any tint of any color.

## QUESTIONNAIRE

1. What is the spectrum?
2. What are the three colors of the spectrum?
3. What are the spectrum primaries?
4. What are the pigmentary primaries?
5. Why are they called spectrum primaries?
6. Why are they called pigmentary primaries?
7. What is white light?
8. What is black?

9. What is white?
10. What is color?
11. What are hues?
12. What are shades or tones?
13. What are tints?
14. What makes us see color?
15. Why does a color look neutralized?
16. Why do we mix colors to make them look neutralized?
17. What are complementaries?
18. What is the benefit of knowing what the complementaries are?
19. What is an after-image?
20. How can we make a color appear more brilliant?
21. How can we make a color with less light on it?
22. Why does adding white paint to a color make it less brilliant?

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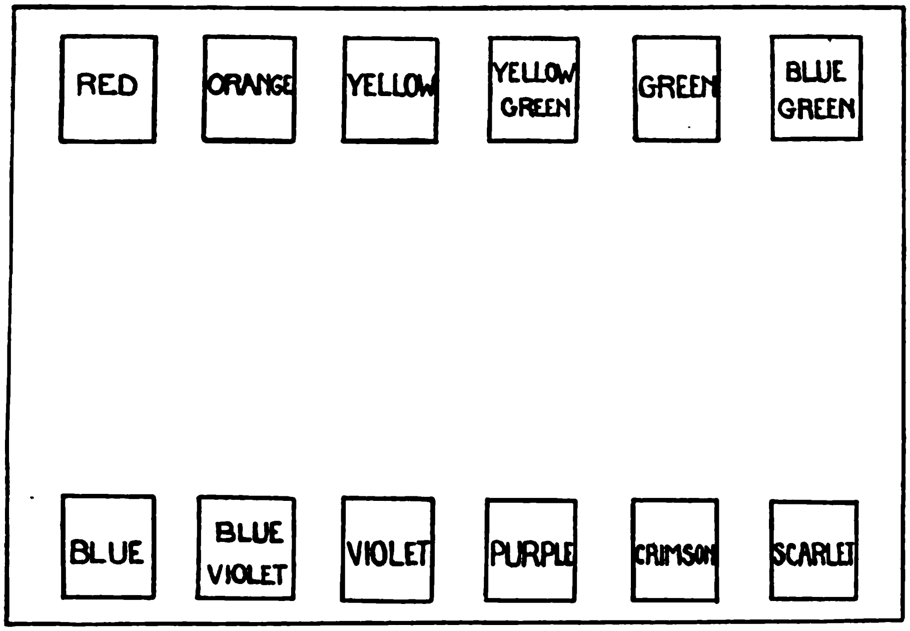
## FIRST LESSON

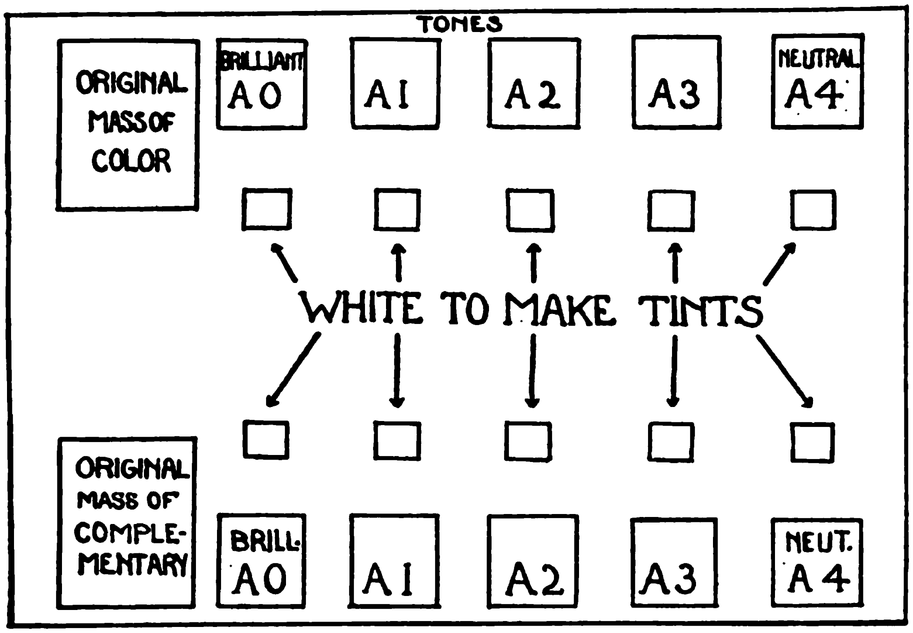
*The Spectrum.*—On chart No. 1, you will find a spectrum chart outlined in black and white. You are to color this the same as the printed color chart, Plate I. The best paints to use are opaque water-colors. A paint should be selected with very strong tinting power, mixed with an opaque substance which will not destroy its brilliancy. Many paint manufacturers put this paint up, and it is known as mat water-color or poster color. You will need a soft sable brush, about a No. 3, to do all these exercises. A china palette, or a plate can be used on which to mix these paints, and a small palette knife with which to mix colors. A very small quantity of paint should be placed on the palette to start this first lesson.

*Red.*—Let us start with securing a red which should be a color known as vermilion. It is important that we get the most brilliant vermilion we can buy as otherwise we will not secure the full benefit of the lesson. Place a small quantity of this paint at the edge of the palette or plate with a palette knife, in the upper left-hand corner.

*Yellow.*—The nearest paint we can get to match this color of the spectrum is lemon chrome or pale cadmium. This should be placed on the palette about an inch and a half away from the red.



LAYOUT OF PALETTE TO MAKE SPECTRUM AND CHARTS 8 TO 87



LAYOUT OF PALETTE TO MAKE COLOR MIXING CHARTS

PLATE V

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*Green.*—The nearest paint we can get to match this color of the spectrum is emerald green. This should be placed about an inch and a half away from the yellow. You must be careful of this paint if it is a true emerald green as it is poisonous and must not be put in the mouth. Unfortunately we can get no other paint which will reproduce the color of the spectrum so truly as this poisonous pigment. It is not good to mix with other colors but will, if left by itself, stand very well.

*Blue.*—The nearest paint we can get to match this color of the spectrum is a color known as cobalt blue. This should be placed in the lower left-hand corner opposite the red.

*Violet.*—The nearest paint we can get to match this color of the spectrum is ultramarine violet. This should be placed about an inch and a half away from the blue, opposite the yellow.

*Crimson.*—We can buy this paint under its own name a color known as lac de gaence or rose malmaiso This should be put an inch and a half to the right of the violet.

Now let us test to see if our colors are correct as far as we have gone. We have learned in a previous chapter that to find out if a color is complementary we must *mix the two together and if they form a perfect neutral gray they are complementary.* We see on the spectrum chart that the complementary of red is blue. So, if we take a little of the red on our brush, and then cleaning the brush

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before we dip into the blue, take a little of the blue and put beside it, mixing the two together, if it forms a perfect neutral gray we know that the blue is complementary to the red, or vice versa. If the mixture does not turn out to be a neutral and looks a little violet or purple we know that either the red tends toward the violet and is not a perfect red, or the blue has too much violet and is not a perfect blue. If the red tends toward the violet we can add a very little yellow and try again, or if the blue is too violet we can add a little viridian green (this green will be described a little later). It is very important that the resulting mixture of the red and the blue are an ***absolutely neutral*** color before we go ahead.

Next, test the yellow with the violet. If the yellow and the violet are correct they will make a perfect neutral when mixed. If the mixture is a little green we know that the yellow has too much of a green cast or else the violet oo blue. To correct this we could add a little of the to the yellow which would take away the green cast it, or we could add a little crimson to the violet. If the mixture of these two colors looks brown, and you do not succeed in making a dead neutral, you will know that there is too much red in the yellow or too much crimson in the violet.

Next we will test the green and crimson. There should be no trouble with these two colors as they are sold under their names of emerald green and crimson, but if the mixture does not come neutral, and looks purple, we know the green has not enough yellow, or the crimson has too much violet. If the mixture is muddy we know that

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the green has too much yellow or the crimson has too much scarlet. By these three mixtures making the neutral we have tested the six colors of the spectrum. Another method would be, to secure the pigmentary primaries; to get a yellow which when mixed with crimson would make a good red and at the same time when mixed with blue will make a brilliant green. To secure a good crimson that will mix with the yellow and make a good red, at the same time when mixed with blue will make a good violet. To secure a good blue that will mix with the crimson and make a good violet, and at the same time when mixed with yellow will make a good green. Now let us make these colors or hues between the six principal colors:

*Orange.*—Mix the red with the yellow until you have a shade between, known as orange, and put this in the space left between the red and the yellow.

*Yellowgreen.*—Next let us mix the yellow with a viridian or emeraude green. We use this viridian or emeraude in place of the emerald green on account of the unreliable qualities of the emerald green, and we can get a yellowgreen almost as brilliant and which will be much more permanent. Place this in the space left between the green and yellow.

*Bluegreen.*—Next let us take the bluegreen-green which very often comes in the color known as emeraude, but if it is not blue enough let us add a little of the blue and place it between the green and blue on our palette.

*Blueviolet.*—Next let us take a little of the blue and the violet and mix the two colors together to form a blueviolet. Place it between the blue and the violet, opposite the orange. This color can be bought without mixing and is called dark ultramarine blue, which sometimes needs a very little crimson or violet, as the color varies according to the manufacture.

*Purple.*—Next let us make a purple with a mixture of the violet and crimson and place it in the space between the crimson and violet, opposite the yellowgreen.

*Scarlet.*—Last let us make a scarlet with crimson and red and place this between the crimson and red, which should complete the spectrum on the palette.

You should now test each of these colors with their complementary to find out if the mixture makes a perfect neutral gray.

When you have succeeded in making these paints in the true colors of the spectrum on your palette, paint them into Chart 1 in their respective places. Put in the spectrum primaries first, then the pigmentary primaries, and last, the hues between. These are designated on this chart by their first initial.

It is necessary that you memorize the complementary colors before going further.

You may now wash your palette and be ready for the next lesson.

## QUESTIONNAIRE

1. What are the twelve colors of the spectrum?
2. What are the twenty-four colors of the spectrum?
3. What is red?

4. What is orange?
5. What is yellow?
6. What is yellowgreen?
7. What is green?
8. What is bluegreen?
9. What is blue?
10. What is blueviolet?
11. What is violet?
12. What is purple?
13. What is crimson?
14. What is scarlet?
15. Name the colors of the spectrum, starting with red and going around the spectrum like the hands of a clock.
16. Name the colors of the spectrum, starting with red and going the reverse way of a clock, or, as it is known, counterclockwise.
17. How do we know if a color is complementary in paint?

## SECOND LESSON

*Color Mixing.*—Set your palette with two colors only, namely, red and blue. The red should be placed in the upper left-hand corner, and the blue opposite in the lower left-hand corner. Be sure these two colors are complementary by testing them in the same way as in the previous lesson, putting out more paint than you used before. Lay out with your palette knife [illegible] batches of the red taken from the original quantity placed on the palette—just enough so that it will cover the tip of the palette knife. Cleaning the palette knife, take a very small quantity of blue and mix with the second batch of red until it neutralizes this red to about the same color that the brilliant red would look like if you shaded it from the light with your

MICHEL JACOBS'S COLOR-MIXING CHARTS

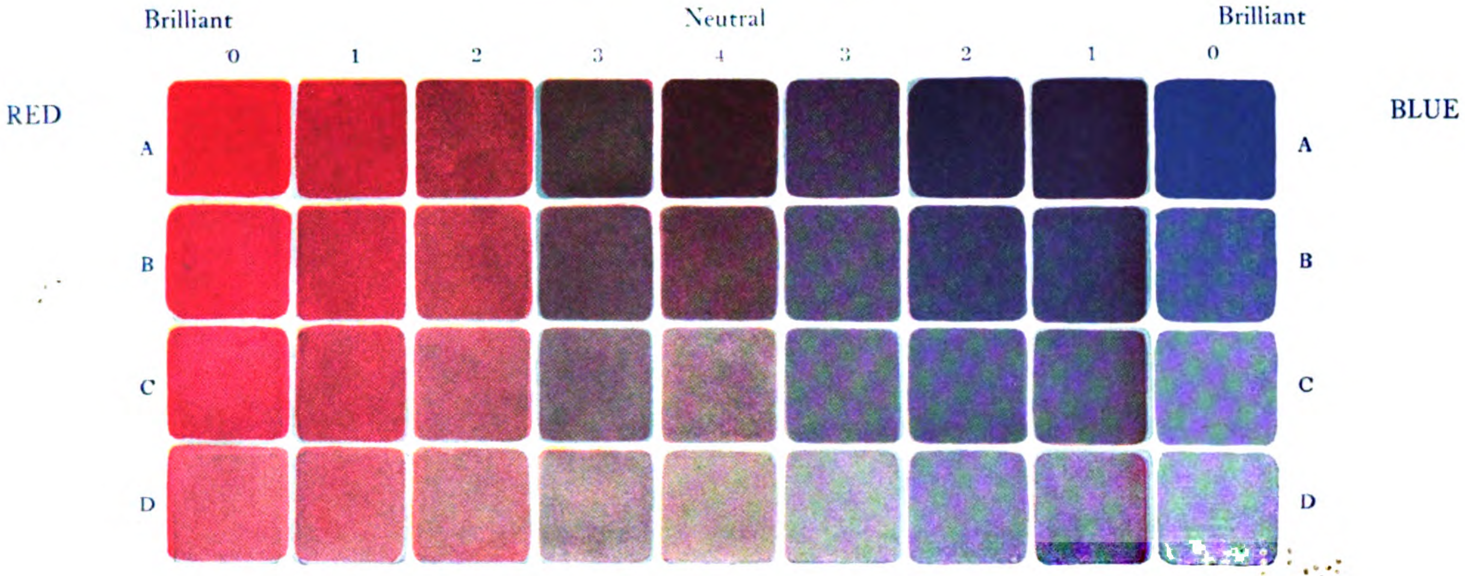

Plate IV

hand. Next mix a little more of the blue with the next lot of red until the shade becomes the same color as the last lot would look like if shaded from the light. Next mix a little more blue with the next lot of red so that it in turn will look a little more neutralized than the previous lot. The last lot of color mix with the blue until it makes a perfect neutral gray. This will give you one original lot of red at the top left-hand corner, besides a small lot of the same color slightly neutralized, another lot more neutralized, and still another lot still more neutralized, and a neutral. Paint these colors in the color-mixing charts No. 2 in their respective places on the top of the chart, namely, under the 0 place the brilliant red; under No. 1 the first neutralization; under No. 2 the second neutralization; under No. 3 the third neutralization; and under No. 4 the true neutral. After you have done this add white to the first brilliant color and place in the space marked B under 0. Now add white to all the other neutralized tones and continue through this B line. Next, cleaning the brush each time, add white again until you get line C, and likewise line D. This will complete your color-mixing chart on the left-hand side the same as is illustrated, Plate IV.

It is now best to wash the palette off, leaving on the original lot of red and blue which we hope has not become fouled by putting in a dirty palette knife or brush. Now lay out the blue in four batches the same as we did in the red, but we would have no use for the fifth batch as that would make a neutral which we have already laid in. Neutralize each one of these blues in the same way. As the blue neutralizes very much quicker than the red you will need very much less of the red in the mixtures than you did in the neutralized reds. Make the neutralized colors evenly divided as you did with the red. You can place these then in their respective place in the color-mixing chart (No. 2). After you have completed this chart No. 2 you will wash your palette, brushes, and knife, and start fresh on the next exercise.

You will now mix an orange in the upper left-hand corner the same as we did with the red, making sure that this orange is the same color as in our spectrum chart, and in the lower left-hand corner, opposite, a batch of blue-violet—this also to be the same color as in the spectrum chart. You must test these two colors to see that they make a perfect neutral gray, in the same way as you did with the red and the blue.

Now lay out five separate batches of color on the top of the palette, as you did with the red, and neutralize the second one with a very little of the blueviolet. Continue through the neutralized oranges to the neutral, as we did with the red, placing these in their respective place on the color mixing chart No. 3, which is marked orange and blueviolet, making the tints as we did with the red. Continue through this with the blueviolet to complete the chart, as we did with the red and blue chart.

We will continue now with making the yellow and violet chart No. 4 in the same way, and afterwards the yellowgreen and purple chart No. 5, the green and crimson chart No. 6, and the bluegreen and scarlet chart No. 7. If you have been careful to get your gradations of color you will find that you have charts which lead gradually from the brilliant to the neutral and from the neutral back again to the brilliant, and the tints leading from the brilliant or strong neutralized color to the very pale tint.

Looking at the chart after we have completed it you will notice again that there are letters and numbers. If we wish to designate accurately any color we can say that the red 0A was as high a brilliancy that we could get, and that 1A would be that some color with less light on it, or, as we call it, neutralized, and if we add white we make the neutralized color tint which we can designate with a letter and a number. You have sixteen different shades and tints to designate on each side of the chart. These colors have been called by different names from time to time and have been very confusing, so hereafter in this book we will designate each color, each shade of color, and each tint by a letter and a number which are called coordinates. For your guidance we write a few of the shades and tones of color with their coordinates, and placing along side of them the different names which they are generally called by. For example, Red 0B, 0C, 0D, 1D, 2D, and 3D are known as pink; with this system of naming the letter and the number of a color we can tell which pink we mean. Another example—1A, 2A, and 3A are all known by different names such as English red, burnt sienna, and Vandyke brown. The tints of these colors cannot be described accurately in the old system, whereas in this system you can designate the exact shade or tint of a color. You will find in the glossary at the last of this book a list of colors and how they can be designated more accurately by this system. Study the color-mixing charts with their shades and tints and make yourself familiar with how each color is mixed, and when you see color outdoors or indoors try to figure out how it would be made. In this way your eye and your mind will become trained to be able to mix the exact color that you wish without experimenting.

## QUESTIONNAIRE

1. How do we neutralize a color?
2. How do we make a tint?
3. What is meant by Red 0A?
4. What is meant by Red 1A?
5. What is meant by Red 0D?
6. Give an example of the same shade and same tint in two colors.
7. Name all the shades of red in full strength, using letters and numbers to designate them.
8. Name the tints of each of these in the same manner.
9. Name all the shades of orange.
10. Name all the shades of yellow.
11. Name all the shades of yellowgreen.
12. Name all the shades of green.
13. Name all the shades of bluegreen.
14. Name all the shades of blue.
15. Name all the shades of blueviolet.
16. Name all the shades of violet.
17. Name all the shades of purple.
18. Name all the shades of crimson.
19. Name all the shades of scarlet.

## THIRD LESSON

### ONE COLOR AND ONE COMPLEMENTARY IN BRILLIANTS

We have made our color-mixing charts, and now if we put the complementaries side by side it will make them both look more brilliant. Taking the chart No. 8 you will find a small design in the upper left-hand corner. You will draw five other designs in the blank spaces left on this chart, with a soft pencil, basing the ideas for your designs on the wild rose.

Take any small flower and split it through the center with a sharp knife and you will find in the split half a very good idea for a design. Then if we study each part of the flower and see how it is made we will get other forms. These should be made with both sides alike, or, as it is known, as a bi-symmetrical design. This can be done by a number of different ways, the simplest of which is to draw half a design on a thin piece of paper, with pencil, folding the paper over and rubbing with the fingernail or bowl of a spoon on the side of the drawing until it rubs off on the other side. By opening the paper you will find that you have a design with both sides alike. This is the way bi-symmetrical designs are done in the practical applied arts. It would be a good idea if you would make a few naturalistic drawings of the flower to get an idea of how it is constructed, drawing some from the face, some in profile, and some with the back. Also draw the leaves and stem; see how the flower and leaves join the stem.

See how the leaves interweave one with the other. See how the light falls on the flower, and what the form is between the shadow and the light. It is good not to watch for the halftones, but just the strong light and the strong shadows. Take each individual petal and see the design of the veining, and forms in the petal itself. Do the same with the leaf. The back of a leaf very often has a great many designs that cannot be seen on the front. Look at the pistil, stamen, calix; in fact, examine every part of the flower, first with its entire form with the light on it, and then, plucking it apart, watch for other designs. You should be able to get about four or five hundred designs from every flower. Be sure that your design covers the entire space on the chart. Another way to get a design would be to take a small piece of tissue paper about four inches by one inch, and twist the end and fray so as to make some kind of a grotesque form. Cast a shadow with this on to a piece of paper about two inches square. This can be done best in front of a window or under a lamp or electric light. Outline this shadow with a soft lead pencil, as is demonstrated on Plate VIII. Fold this paper and transfer this design on to the other half of the paper by rubbing on the back with your fingernail or bowl of a spoon.

Before making designs on charts No. 8 and No. 9 it is well for the student to make numbers of different designs on other sheets of paper, until he becomes proficient and the designs have real merit.

By putting one color and one complementary next to each other we use one complete spectrum. We have

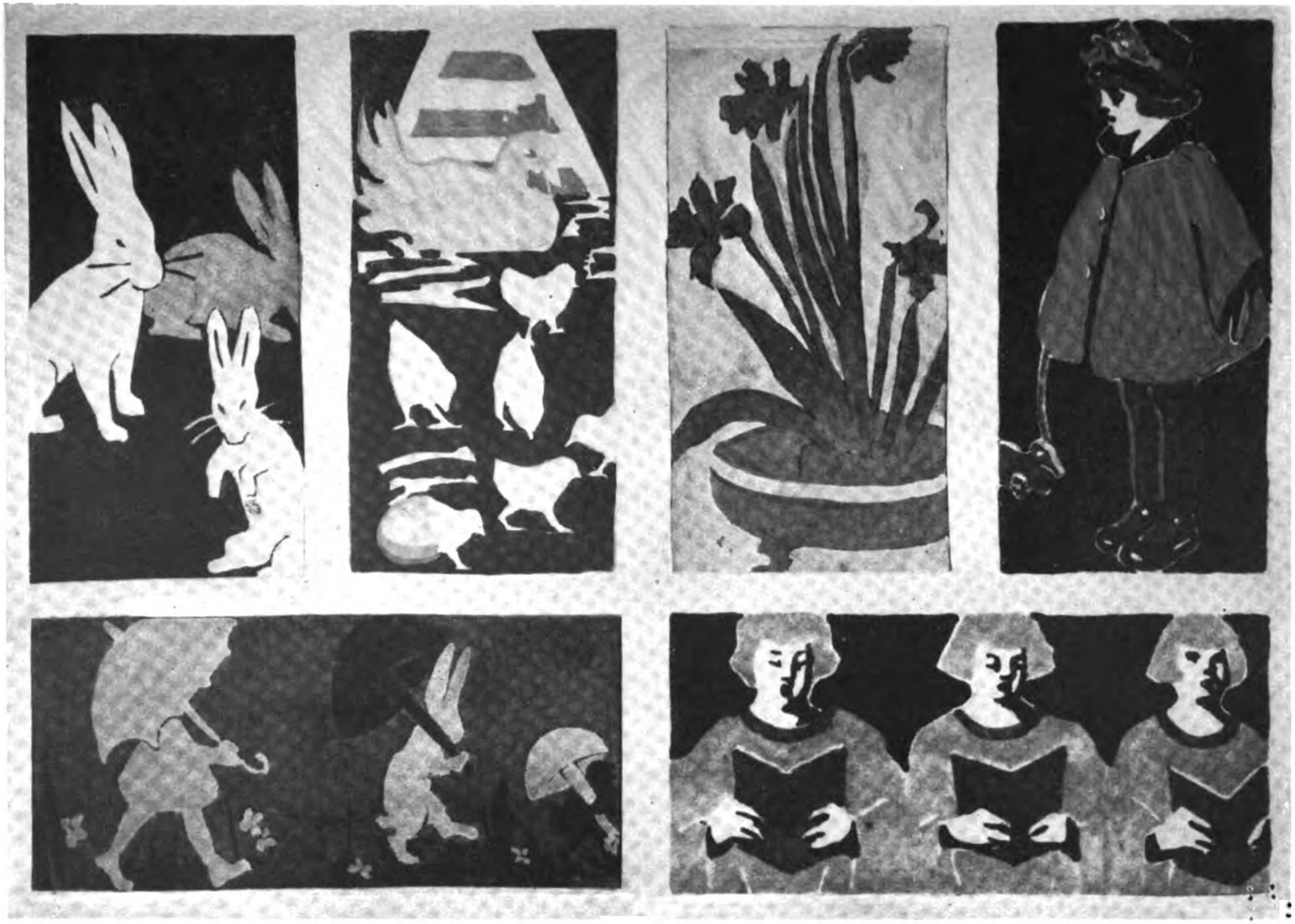

PLATE VI

## BRILLIANT COMPLEMENTARIES

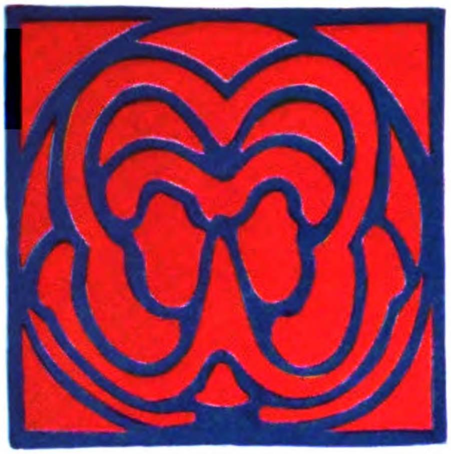
Fig. 1

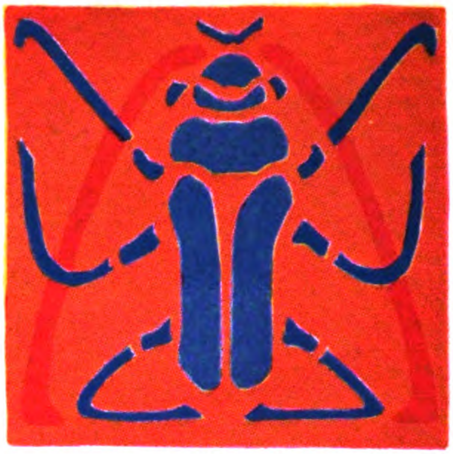
Fig. 2

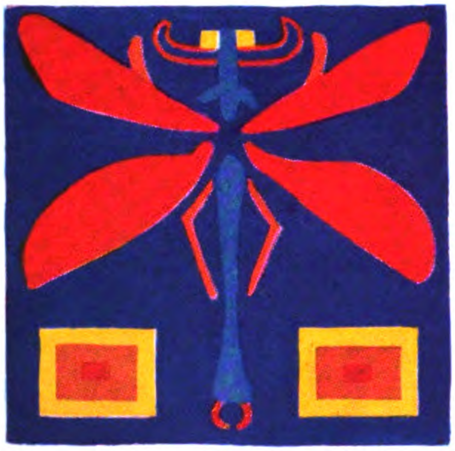
Fig. 3

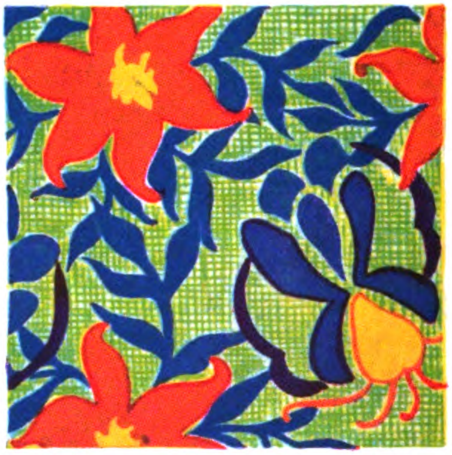
Fig. 4

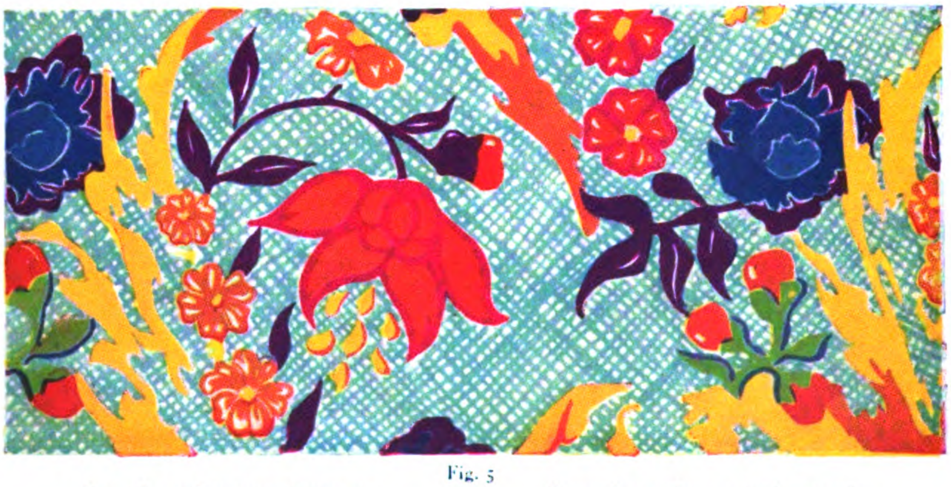
Fig. 5

One color and one complementary
Fig. 1 Red
Blue

Two colors and two complementaries
Fig. 2 Red and Orange
Blue and Blue-violet

Three colors and three complementaries
Fig. 3 Red, Orange, Yellow
Blue, Blue-violet, Violet

Four colors and four complementaries
Fig. 4 Red, Orange, Yellow, Yellow-green
Blue, Blue-violet, Violet, Purple

Five colors and five complementaries
Fig. 5 Red, Orange, Yellow, Yellow-green, Green
Blue, Blue-violet, Violet, Purple, Crimson

PLATE VII

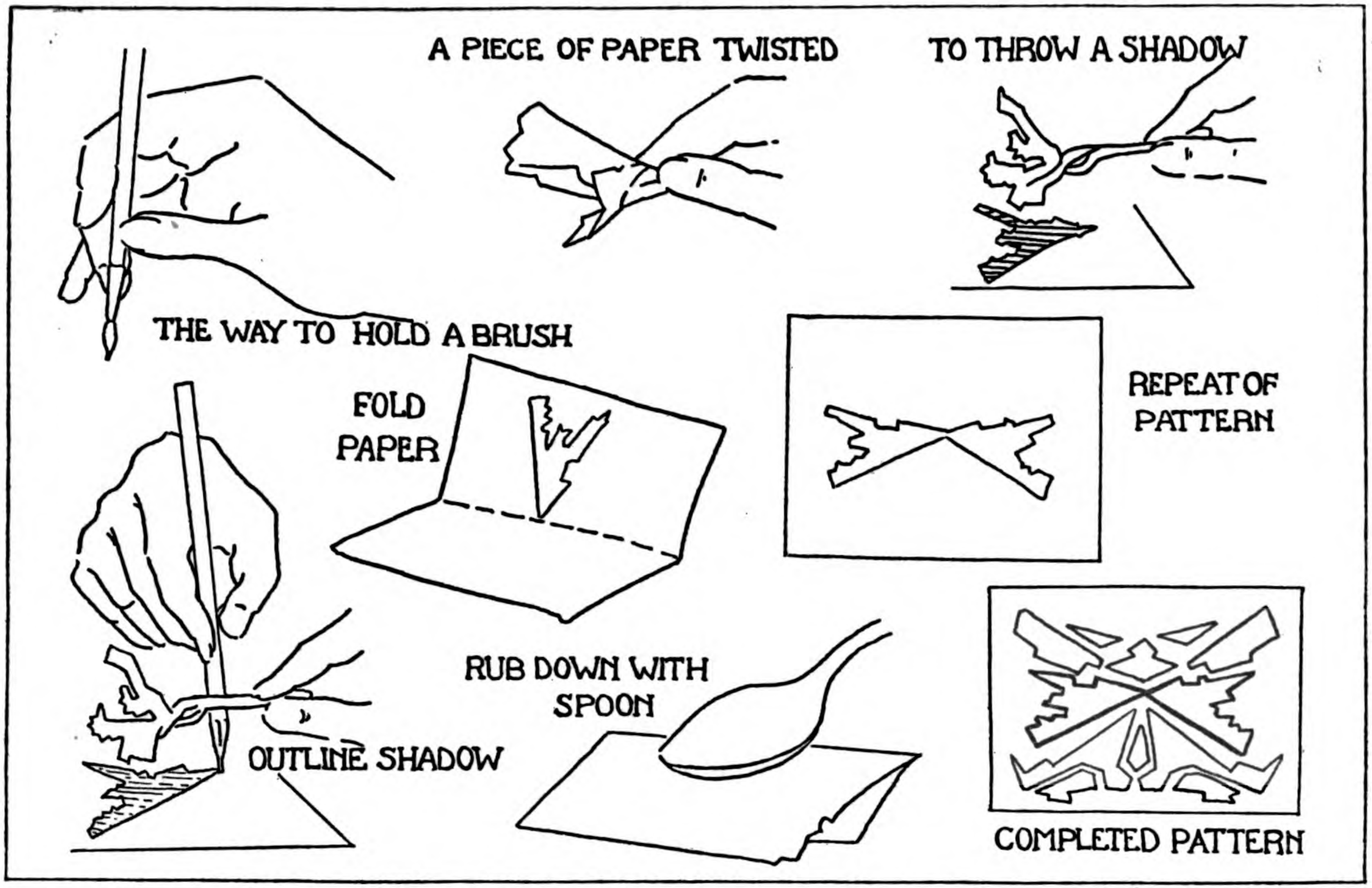

PLATE VIII.—How to Make Shadowgraphs

learned in the first chapter that the spectrum is made up of three colors, and by the combination of any two of these we make six colors which are known as spectrum primaries and pigmentary primaries, and we have also learned that the pigmentary primaries are complementary to the spectrum primaries, or vice versa. For example, if we have a red paint we know that this uses up one-third of the spectrum, and if we take the green ray of light with the violet ray of light we get a sensation of blue, so we see that blue is complementary to the other primary, red. Likewise, if we take the green paint and wish to find the complementary we must mix the two other rays of light, which are violet and red, which would give us a sensation of crimson, so that we say that crimson is the complementary of green, and vice versa, and if we take a violet paint we would have to take the rest of the spectrum, which is red and green, which would give us a sensation of yellow, so that yellow is the complementary of violet. If any of these complementaries are put side by side we have completed one spectrum, and the sensation is pleasing. Now if we take an orange paint which contains all of the red rays and very little of the green rays, the complementary of this color to complete one spectrum would be blueviolet because blueviolet has all the violet rays and the balance of the green rays which we did not use with the orange. The same as if we had one apple and divided it in three equal parts: If we wish to make a division of two parts only we would have to take part of one of the thirds of the apple and add it to the other third. If we took a greater portion of the third of the apple to add to one of the thirds we would have less of that third to add to the other portion, but we would always have one apple. We can divide these three equal parts in greater or lesser portions, but always having only one apple—and so with complementaries.

Continuing with the colors between the three spectrum primaries and the three pigmentary primaries, the yellow-green would be complementary to purple because yellow-green is made of all of the green rays and a very little of the red rays, and it is complementary to purple because purple contains all the violet rays and the balance of the red rays which we did not use in the yellowgreen. The bluegreen is complementary to scarlet because bluegreen contains all the green rays and a very little of the violet rays, and the scarlet contains all the red rays and the balance of the violet rays which we did not use in the bluegreen. You see, we have had only one spectrum, dividing it up in different proportions, and when we bring them together in a design the effect is pleasing to our eye because we have used one completed unit. Of course, this is all based on light, but that is the way we see color, if you will remember the way it was explained in the previous chapters.

The student should also try to make some of the designs with the one color predominating. For example, the one design could be with the red in large masses and the blue in small masses; in other words, it would be a red design which has a little blue. Then other designs could be made with more blue than the red, and still other designs with even proportions of red and blue. There should be very little white space left, only that which is between each color on some designs, and on others leaving a little more or a little less white spaces, using the white of the paper to form a design with the red and the blue. This should be done with all the other color combinations in single complementaries.

## QUESTIONNAIRE

1. Name each color of the spectrum with its complementary.
2. What is meant by one color and one complementary?
3. What part, or how many spectrums, did we use in making this combination?
4. What makes a color look more brilliant?
5. How can we divide one complete spectrum?
6. If we divide it in two what do we make?
7. Do we always have to divide the spectrum in halves?
8. Give an example as to how you can divide the spectrum, using some other object as an example.
9. What is an "after image"?
10. What is the color of the "after image"?
11. Give examples of one color and one complementary.
12. Is red complementary to green or to blue?
13. Is yellowgreen complementary to purple or to crimson?
14. Is green complementary to crimson or to purple?
15. What is the difference between crimson and purple?
16. What is the difference between purple and violet?
17. What is the difference between yellowgreen, green, and bluegreen?
18. What is the difference between blue and blueviolet?

## FOURTH LESSON

### Two Colors and Two Complementaries in Brilliants

We now start to make a color combination with four colors which we call two colors and two complementaries.

Two colors and two complementaries means that we have taken two distinct spectrums. We can divide these up any way we wish as long as we always keep the two spectrums like we did in the one color and one complementary. We can divide one spectrum up into two equal parts and we can divide the other one up into two equal parts. This is what we call two colors and two complementaries.

Looking at chart No. 10 you will find another design already drawn which is based on a conventionalization of the violet. Taking the violet the same as we did with the wild rose in the previous lesson, cutting it through, we will get one side of the design which we can duplicate in the same manner as we did in the previous lesson, and likewise as we did in the previous lesson we should make a number of separate papers, making different designs, and color them with the large masses and the small masses, only this time we use two colors and two complementaries, the first design being made in red and orange with blue and blue-violet. We can make two large masses equally divided in red and orange, and smaller masses in their complementaries of blue and blueviolet, or vice versa. For example, we can make the background a blue, and the design both in the red and orange with small parts of blueviolet, or we could reverse this order. After you have succeeded in making designs which you think worthy draw them in the book in the empty spaces, and color all six designs including the one which is already printed there, as follows:

1. Red and orange with blue and blueviolet.
2. Orange and yellow with blueviolet and violet.
3. Yellow and yellowgreen with violet and purple.
4. Yellowgreen and green with purple and crimson.
5. Green and bluegreen with crimson and scarlet.
6. Bluegreen and blue with scarlet and red.

You will see that you have not repeated any color combination; although you have used some of the colors twice, the combination is different.

Exercises should be done in some of the colors of the 24-color spectrum chart. For example, one design in red and red-orange, the latter a color between red and orange, and their complementaries blue and violet-blue, which is a color between blueviolet and blue. In this way you would be able to get twelve distinct color combinations instead of six designs as in the 12-color spectrum.

## QUESTIONNAIRE

1. What is two colors and two complementaries?
2. How many spectrums did we use in making two colors and two complementaries?
3. Give an example of two colors and two complementaries.
4. Give an example of two colors and two complementaries, having one color blue.

5. Give an example of two colors and two complementaries, having one color red.

6. Give an example of two colors and two complementaries, having one color yellow.

7. Give an example of two colors and two complementaries, having one color crimson.

8. Why are two complementaries pleasing to the eye?

## FIFTH LESSON

### THREE COLORS AND THREE COMPLEMENTARIES IN BRILLIANTS

This lesson is a continuation of brilliant color complementaries, only this time instead of using two colors and two complementaries, or four colors, we make the designs in three colors and three complementaries, or six colors. This is the same as if we were using three spectrums—we divide each spectrum into two parts.

You will find a design on chart No. 12 which is a conventionalization of a daisy. It is not necessary to make this conventional design look like a daisy, but the different parts can be used to make a design. Certain parts can be made from the petals, certain parts from the leaves, and certain parts from the center or circle. We should make many designs before putting them in the book, the same as we did in the previous lesson, and color them with different masses of color to get the effect, and also try out the 24-color spectrum as we did in the previous lessons. The designs are to be colored as follows:

1. Red, orange, and yellow with blue, blueviolet, and violet.

2. Orange, yellow, and yellowgreen with blueviolet, violet, and purple.

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3. Yellow, yellowgreen, and green with violet, purple, and crimson.

4. Yellowgreen, green, and bluegreen with purple, crimson, and scarlet.

5. Green, bluegreen, and blue with crimson, scarlet, and red.

6. Bluegreen, blue, and blueviolet with scarlet, red, and orange.

Here again you see we have made six designs without repeating any of the color combinations, and still have used some single colors three times.

By using the 24-color spectrum we can make twelve designs without repeating any of the color combinations, although we might use each separate color twelve different times.

## QUESTIONNAIRE

1. What is three colors and three complementaries?

2. How many spectrums do we use in three colors and three complementaries?

3. Give an example of three colors and three complementaries.

4. Give an example of three colors and three complementaries, one color of which will be red.

5. Give an example of three colors and three complementaries, one color of which will be green.

6. Give an example of three colors and three complementaries, one color of which will be blue.

7. Give an example of three colors and three complementaries, one color of which will be purple.

8. Can we make any more color combinations than with the 12-color spectrum chart?

9. Give an example of three colors and three complementaries, one color of which is red-orange.

10. Give an example of three colors and three complementaries, one color of which is scarlet-red.

11. Give an example of three colors and three complementaries, one color of which is green-blue.

## SIXTH LESSON

### Four Colors and Four Complementaries in Brilliants

We now make a color combination with eight colors, or four colors and four complementaries. This is the same as if we used four separate spectrums and divided them each into four equal parts. This time we take as our means of inspiration to make the conventional design the buttercup. We should examine this flower closely as it is a very simple flower, and splitting it in half like we did in the previous lesson will not give us very many ideas of a design, but by watching the way it grows on the stem, and even using the complete plant as a means of decoration, as you see has been done with the design printed on chart No. 14, you will get many ideas. Again, we should make numbers of separate papers so that when our designs are put in the book they will be something which we wish to preserve, as we may want to use these designs for screens, lamp shades, or other things with which we decorate our homes.

Instead of putting in these colors flat as we did in the previous lessons, they should be put in with a texture, as you will see demonstrated in Fig. 5, Plate VII. Sometimes we can make a cross-line background, sometimes we can make a dotted background, sometimes we can make a basket-weave background, and sometimes a diagonal background, etc. This will give you what we call texture. Each time you may leave a very little of the white paper show through, but of course at no time should you use white paint, as the color must be always brilliant. The conventionalized flower may be put in solid; by contrast with the solid masses against the open-work background it will give you depth.

You will be particularly careful to get the arrangement of space pleasing to the eye, for instance, if you have a small flower you must not leave too large a space empty. Do not put your design in the center, but try to find a place a little less than two-thirds to one side; this is called the artistic center in a different form of composition than bi-symmetrical, and the exact spot where to place this will be explained to you in future lessons. Do not leave the background entirely white, and if necessary repeat the same color that you used on the background on the design itself. The designs should be colored as follows:

1. Red, orange, yellow, yellowgreen with blue, blueviolet, violet, purple.
2. Orange, yellow, yellowgreen, green with blueviolet, violet, purple, crimson.
3. Yellow, yellowgreen, green, bluegreen with violet, purple, crimson, scarlet.
4. Yellowgreen, green, bluegreen, blue with purple, crimson, scarlet, red.
5. Green, bluegreen, blue, blueviolet with crimson, scarlet, red, orange.
6. Bluegreen, blue, blueviolet, violet with scarlet, red, orange, yellow.

Here again you will see that we have made six separate designs, none of which repeat the same color combinations, although we have used some of the colors four times. Exercises should be done in some of the colors of the 24-color spectrum chart the same way as we did in the previous lessons. In this way we would be able to get twelve designs without repeating any of the color combinations, although we might use each separate color twelve different times.

## QUESTIONNAIRE

1. What is four colors and four complementaries?
2. How many spectrums do we use in making four colors and four complementaries?
3. Give an example of four colors and four complementaries, one color of which is red.
4. Give an example of four colors and four complementaries, one color of which is blue.
5. Give an example of four colors and four complementaries, one color of which is green.
6. Give an example of four colors and four complementaries, one color of which is crimson.
7. Give an example of four colors and four complementaries, one color of which is blueviolet.
8. Give four examples of four colors and four complementaries, using the colors from the 24-color spectrum chart.

## SEVENTH LESSON

### Five Colors and Five Complementaries in Brilliants

This combination of colors is the last of the brilliant complementaries and is called five colors and five complementaries. Again referring to Plate I, if you take the colors, red, orange, yellow, yellowgreen, and green

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you will have five colors and their complementaries which would make what is known as fives and fives. Referring to chart 16 you will find a design in a more or less conventionalized form of a lily. This is very similar to the four complementaries, and should be colored in the same way, trying to get different textures or handling, as is explained in the previous lesson. This time instead of getting the flower in a flat tone it is good to try to model the flower by leaving some of the white paper, which means that you should paint your design in such a way that the white of the paper would show through and help you in getting the design. If you refer to Plate VII you will see this carried out in color. The background may be either solid or open-work; if the flower has a great deal of the white paper showing do not leave as much in the background because the white of the paper would attract more attention than the design itself.

For the advanced student you can use a conventionalized landscape or figure composition as is shown on Plate VI.

Again make the five extra designs to be put on Chart 16, first making a number of designs on extra sheets before entering in the book, and color all six designs, including the one which is already printed there, as follows:

1. Red, orange, yellow, yellowgreen, green with blue, blueviolet, violet, purple, crimson.
2. Orange, yellow, yellowgreen, green, bluegreen with blueviolet, violet, purple, crimson, scarlet.
3. Yellow, yellowgreen, green, bluegreen, blue with violet, purple, crimson, scarlet, red.

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4. Yellowgreen, green, bluegreen, blue, blueviolet with purple, crimson, scarlet, red, orange.

5. Green, bluegreen, blue, blueviolet, violet with crimson, scarlet, red, orange, yellow.

6. Bluegreen, blue, blueviolet, violet, purple with scarlet, red, orange, yellow, yellowgreen.

Again you will see that you have six different color combinations without repeating any of them. Exercises should also be done in the 24-color spectrum in the same way as in the previous lesson.

In doing this exercise it is well to do some designs with the colors that are in analogous harmony together, for example, red, orange, yellow, yellowgreen, green in the order in which they are named, the parts of the design next to each other. For example, the flower might be done in these colors. The background could be done in the complementaries, keeping the harmonies together.

Also other designs should be done in putting the complementaries together. For example, the background could be made with red and blue, orange and blueviolet, and the flower done with yellow and violet, yellowgreen and purple, green and crimson. In this way you will get a very good idea of the possibilities of the arrangement of colors and the effect which you get from them.

In the first set of designs, putting the harmonies together the sensation is much more restful, while putting the complementaries side by side the effect is very much more brilliant and turbulent.

## QUESTIONNAIRE

1. What is five colors and five complementaries?

2. How many spectrums do you use in making five colors and five complementaries.

3. Give an example of five colors and five complementaries, one color of which is orange.

4. Give an example of five colors and five complementaries, one color of which is blueviolet.

5. Give an example of five colors and five complementaries, one color of which is bluegreen.

6. Give an example of five colors and five complementaries, one color of which is scarlet.

7. Give an example of five colors and five complementaries, one color of which is yellow.

8. Give an example of five colors and five complementaries, using the colors from the 24-color spectrum chart.

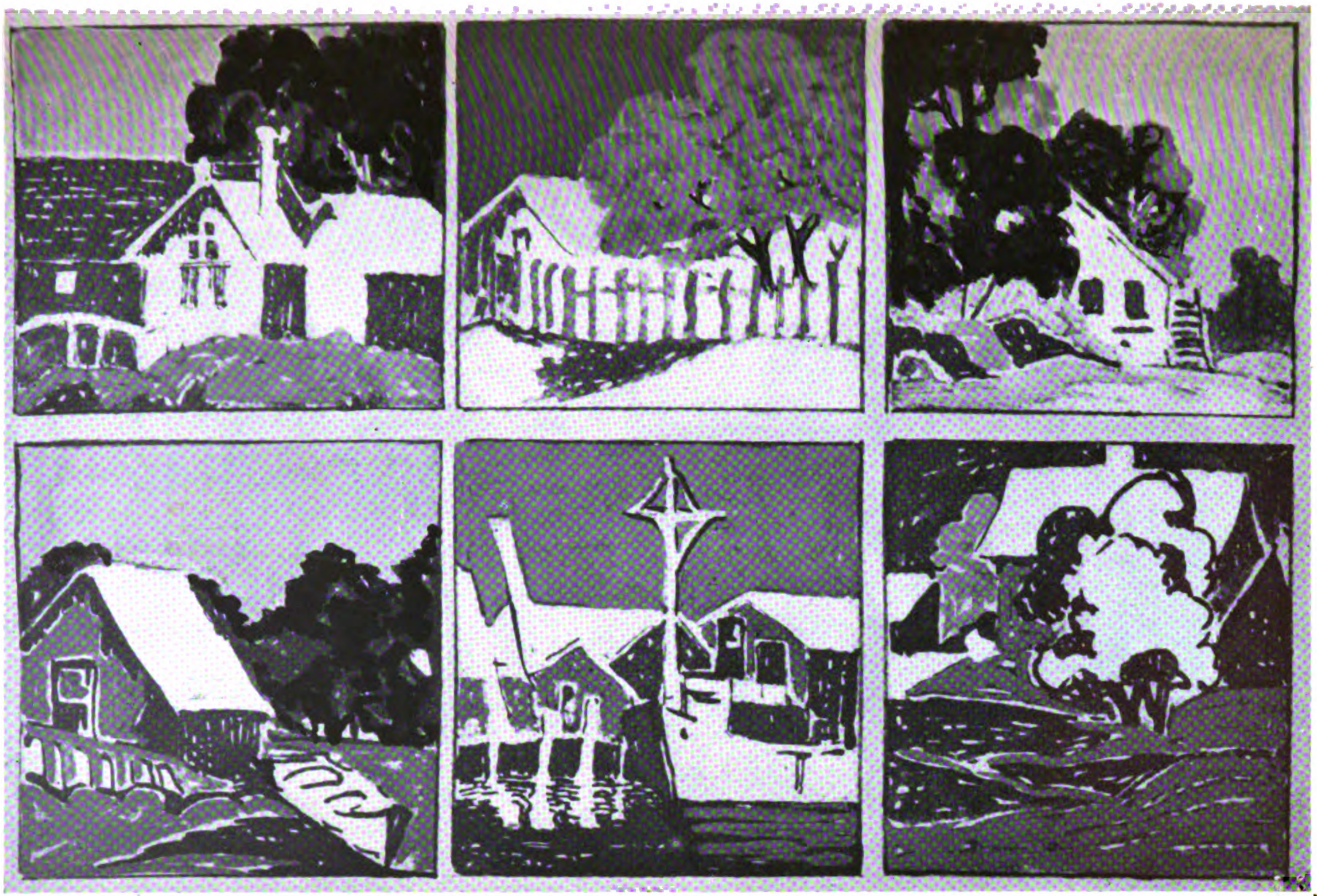
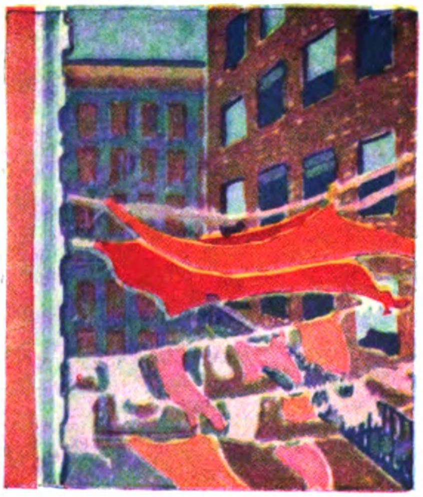


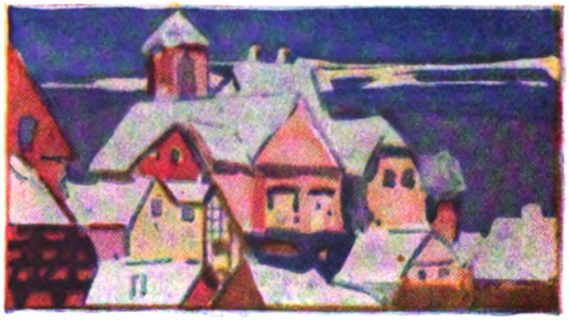
Plate IX



Two colors and two complementaries

red, orange

blue, blue-violet



Three colors and three complementaries

red, orange, yellow

blue, blue-violet, violet

Plate X

## SECOND SECTION

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## EIGHTH LESSON

### ONE COLOR AND ONE COMPLEMENTARY IN NEUTRALIZD TONES AND TINTS

We now come to the part of color study where our colors are more subdued, using neutralized colors or pastel tints. Many people prefer gray colors to brilliant colors, and for certain purposes undoubtedly the gray or neutralized colors are much more adaptable; however, there are times when we really need spots of color that are more brilliant. We never hesitate in putting a brilliant bowl of flowers on the table, but we sometimes hesitate in putting a brilliant picture on the wall; still, if everything is in keeping the brilliant color has a very exhilarating effect.

We have learned from our color-mixing chart in the Second Lesson that we can neutralize any color by adding its complementary and getting the tint of that shade or tone by adding white. Taking the design that is on chart No. 18, which is a conventionalized landscape, we draw five more designs using some of the ideas which are illustrated on Plate IX. It is not good to keep these designs exactly, but to originate from them, taking the trees and using them in our own compositions.

We can now get what we call values in our landscape because the more we neutralize each color the more it will recede; adding white also makes a color recede. Looking at the color-mixing charts you will find that the brilliant color 0A advances and attracts our eye more than any other color on the chart. You will also notice that the shades known as 0B and 1A recede in the same degree; you will also notice that the colors known as 0C, 1B, and 2A recede in the same degree. Now you will also notice that 0D, 1C, 2B, and 3A recede in the same degree, and likewise 1D, 2C, and 3B recede in the same degree, and 2D and 3C recede in the same degree. 3D is the one tint of a shade which receded further than any other. The dead neutral of any color in all its tints, if used with a brilliant color, will make that neutral look like its complementary. This is on account of our eyes seeing what we call the after image, as was explained in a previous chapter. Instead of the brilliant if the color is neutralized, however, the less will this effect be noted. While studying color it is not a good idea to use this dead neutral, but after the eye has become trained to see color these grays or neutralized colors make some very pleasing effects with brilliant colors.

After making a number of drawings on the order of the one illustrated, and filling in the blank spaces on chart No. 18, you will color the first design in red and blue only. This time you may mix some of the complementary color with the red, trying to get three different values, for example, 1A, 2A, and 3A, not using the brilliant tone at all. You will do the same with the blue that you use. In using these shades the foreground should be painted in 1A, the middle distance in 2A, and the distance in 3A. This will give you depth.

Color the designs as follows:

1. Red and blue.
2. Orange and blueviolet.
3. Yellow and violet.
4. Yellowgreen and purple.
5. Green and crimson.
6. Bluegreen and scarlet.

Another set of designs which can be a repeat of the ones already used should be colored in the B line, 1, 2, and 3, another set of designs in the C line, 1, 2, and 3, and another set of designs in the D line, 1, 2, and 3. By repeating the same designs you can make the different shades and tints on each page. This will show you the entirely different effect that can be gotten by using the neutralized color and the tint.

You can also use the 24-color spectrum in the same way, getting all the different shades and tones with the twenty-four colors instead of with just twelve.

## QUESTIONNAIRE

1. What is a neutralized color?
2. How do we know if a color is complementary?
3. How do we make a shade?
4. How do we make a tint?
5. How many spectrums do we use when we have one color and one complementary in neutralized tones?
6. What does white do to a color?
7. How do we get the values?
8. How do we get a color to recede?

## NINTH LESSON

### Two Colors and Two Complementaries in Neutralized Tones and Tints

We now continue with the exercises in grayed or neutralized colors in the same way that we did with the brilliant colors, taking two colors and two complementaries in gray. As is explained in a previous chapter, using two colors and two complementaries is the same as using two spectrums. Now if you can imagine taking these two spectrums and having parts of the spectrum combined with less light on, and some parts with more light on, you will have an idea of what two colors and two complementaries in gray mean. This lesson should be done in conventionalized landscape as is demonstrated in the upper left-hand corner on chart No. 20. You are to make five more landscapes on this page, using some of the elements as shown on Plate XII.

You will also make numbers of other extra sheets with conventionalized landscapes, as you did in the previous lesson, repeating the same design in all six spaces.

Color these designs, the first one in the brilliant color which is oA, and using oB, oC, and oD in the same design. Each spot of color should be put on separately and not shaded or blended on the paper. Each little spot of hue, tint, or tone should be put on like a mosaic.

Color the designs as follows:

1. Red and orange with blue and blueviolet.
2. Orange and yellow with blueviolet and violet.

3. Yellow and yellowgreen with violet and purple.
4. Yellowgreen and green with purple and crimson.
5. Green and bluegreen with crimson and scarlet.
6. Bluegreen and blue with scarlet and red.

All of these colors, as is explained above, should be put in with their gradations in the tints of the brilliant color.

Another chart on which you have drawn another design repeated six times you will color on 1—A, B, C, and and D. Another set of designs you will color in 3—A, B, C, and D.

You will understand that it is possible to color the ones and ones in the same way as we have just done with the two colors and two complementaries, or to color the two colors and two complementaries the way we did with the one color and one complementary, using the tints and tones either across the color-mixing chart, or down.

You can also use the 24-color spectrum as you did in the previous lessons, getting all the different shades and tones with the twenty-four colors instead of with just twelve.

## QUESTIONNAIRE

1. How many spectrums do we use when we have two colors and two complementaries in neutralized tones?
2. What happens to a color when we neutralize it?
3. What kind of a color advances the most?
4. In what order does the neutralized color recede?
5. Name a set of shades which recede one further than the other.
6. How do we get depth?

## TENTH LESSON

### THREE COLORS AND THREE COMPLEMENTARIES IN NEUTRALIZED TONES AND TINTS

Continuing our exercises in the grayed complementaries we will again make five more designs to fill in the chart No. 22 with conventionalized landscapes, again getting our idea from Plate IX, and making extra sheets as we did before.

Exercises in the book should be colored as follows:

1. Red, orange, yellow with blue, blueviolet, violet.
2. Orange, yellow, yellowgreen with blueviolet, violet, purple.
3. Yellow, yellowgreen, green with violet, purple, crimson.
4. Yellowgreen, green, bluegreen with purple, crimson, scarlet.
5. Green, bluegreen, blue with crimson, scarlet, red.
6. Bluegreen, blue, blueviolet with scarlet, red, orange.

All of these colors should be neutralized, or, using the tints, one side of charts being colored with 0A, 1B, 2C, and 3D, which is taking the diagonal of the color-mixing chart.

As was explained before, the brilliant or 0A color is the most advancing and the 3D is the most receding, so you can see by using these colors in the diagonal as we have done, we make the 3D in distance and the 0A or brilliant color in the foreground. Another set of charts can be made using 1A, 2B, and 3C. Another set of charts can be made using 0B, 1C, and 2D.

You can also use the 24-color spectrum as you did in the previous lessons, getting all the different shades and tones with the twenty-four colors instead of with just twelve.

## QUESTIONNAIRE

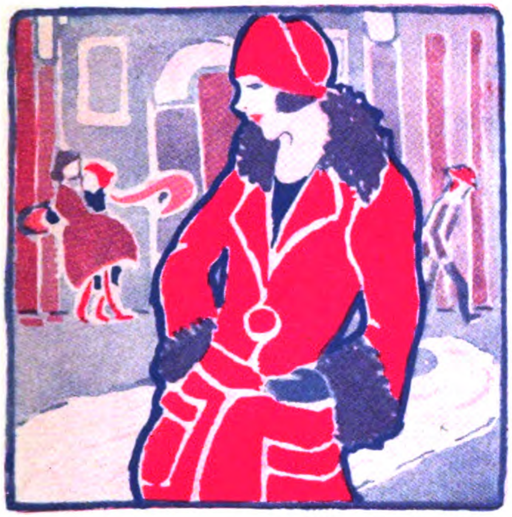
1. What is meant by three colors and three complementaries in neutralized tones?
2. How many spectrums do we use in three colors and three complementaries in neutralized tones?
3. Give an example of three colors and three complementaries, keeping all tones in the B line.
4. Give an example of three colors and three complementaries, keeping all tones in the C line.
5. Give an example of three colors and three complementaries, keeping all tones in the D line.
6. What other way can we make three colors and three complementaries neutralized so that the colors recede?
7. Give an example of three colors and three complementaries with the colors advancing.
8. What would be the most advancing color combination?

## ELEVENTH LESSON

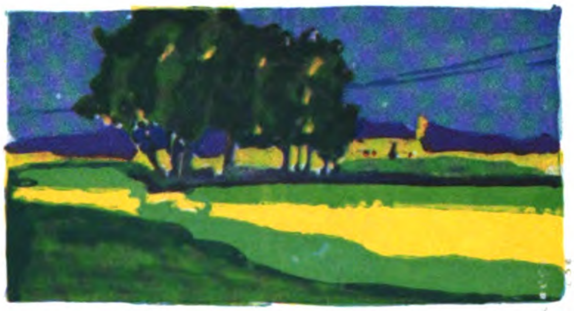
### FOUR COLORS AND FOUR COMPLEMENTARIES IN NEUTRALIZED TONES AND TINTS

Again taking up the study of neutralized complementaries—this time we are taking eight colors, or, as it is known, four colors and four complementaries. There should be no trouble now in understanding the way these charts are to be colored. You can make extra charts other than are in the book to try out different color com-

## HARMONIES IN GRAYS



4 colors



Six colors—yellow, yellow-green, green, blue-green, blue, blue violet

Plate XI

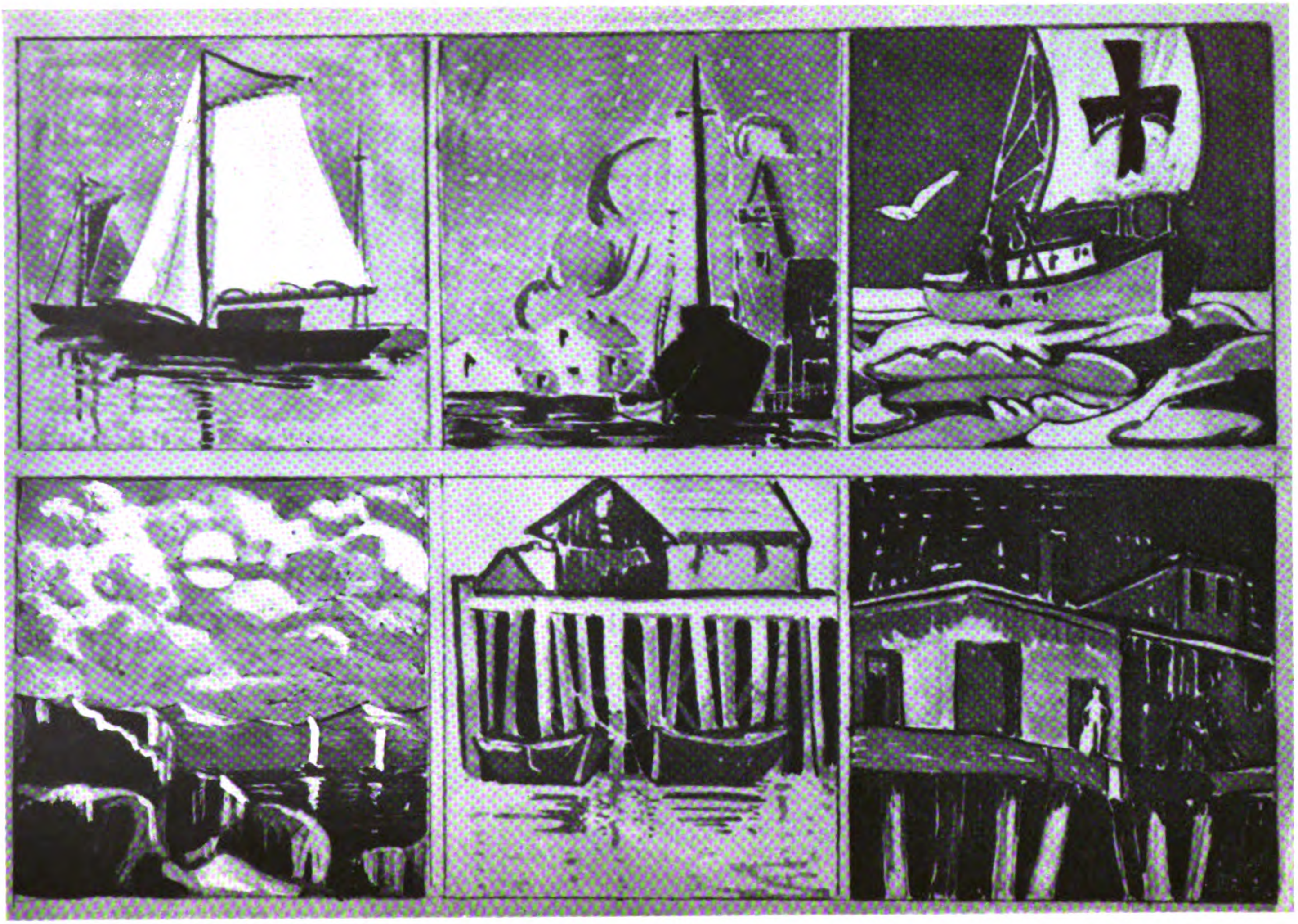


Plate XII

binations. After drawing in the designs in the empty spaces left in chart No. 24, and making the extra charts, you will color the designs as follows:

1. Red, orange, yellow, yellowgreen with blue, blueviolet, violet, purple.
2. Orange, yellow, yellowgreen, green with blueviolet, violet, purple, crimson.
3. Yellow, yellowgreen, green, bluegreen with violet, purple, crimson, scarlet.
4. Yellowgreen, green, bluegreen, blue with purple, crimson, scarlet, red.
5. Green, bluegreen, blue, blueviolet with crimson, scarlet, red, orange.
6. Bluegreen, blue, blueviolet, violet with scarlet, red, orange, yellow.

You will make these in the following gradations: One set of charts in 3A, 2B, 1C, and 0D. Another set of designs in 2A, 1B, and 0C. Another set in 3B, 2C, and 1D. This takes the diagonal in the opposite way that we did in the previous lesson, but of course it is understood that you can make either one color and one complementary, two colors and two complementaries, or three colors and three complementaries in any one of these directions with the tints and shades, the examples given here simply showing the possibilities as we advance, in the number of colors, taking up the neutralizing in different methods. You can also use the 24-color spectrum in the same way as you did in the previous lessons, getting all the different shades and tones with the twenty-four colors instead of with just twelve.

## QUESTIONNAIRE

1. Give an example of four colors and four complementaries in neutralized tones using all colors in No. 1 shade.
2. Give an example of four colors and four complementaries in neutralized tones using No. 2 shade.
3. Give an example of four colors and four complementaries in neutralized tones using No. 3 shade.
4. Give an example of four colors and four complementaries, each color with a different number and letter.
5. Give an example of four colors and four complementaries using the diagonal in color-mixing chart.
6. Give an example of four colors and four complementaries using the 24-color spectrum chart.

## TWELFTH LESSON

### FIVE COLORS AND FIVE COMPLEMENTARIES IN NEUTRALIZED TONES AND TINTS

This is the last of the color complementaries in neutralized or grayed colors. Again making the designs in the spaces left on chart No. 26, and making extra charts as before directed, you will color these as follows:

1. Red, orange, yellow, yellowgreen, green with blue, blueviolet, violet, purple, crimson.
2. Orange, yellow, yellowgreen, green, bluegreen with blueviolet, violet, purple, crimson, scarlet.
3. Yellow, yellowgreen, green, bluegreen, blue with violet, purple, crimson, scarlet, red.
4. Yellowgreen, green, bluegreen, blue, blueviolet with purple, crimson, scarlet, red, orange.

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5. Green, bluegreen, blue, blueviolet, violet with crimson, scarlet, red, orange, yellow.

6. Bluegreen, blue, blueviolet, violet, purple with scarlet, red, orange, yellow, yellowgreen.

You will color one set of charts using 0A or brilliant color with 1A and 2B. Another set of charts using 3D with 3C and 2D. Another set of charts should be colored in 3A, 3B, 0A, and 0B. Another set of designs should be colored in 3A and 2A with 3D and 2D. You can also use the 24-color spectrum in the same way as you did in the previous lessons, getting all the different shades and tones with the twenty-four colors instead of with just twelve.

This will give you a chance to show large masses of light against dark shadows. Many more values in the tints and shades can be made, but the student can easily grasp now the possibilities of using the shades and tints, and make up other combinations which have not been mentioned. The combinations are really innumerable, but if you become familiar with the ones mentioned in these exercises you will be able to have a power in the use of color to express any idea of emotion, which is the essence of true art.

## QUESTIONNAIRE

1. Give an example of five colors and five complementaries in neutralized tones, using the numbers and letters to designate shades of the darkest value and lights of the palest tint.

2. How many spectrums do we use in making five colors and five complementaries in neutralized tones?

3. What is a tint?

4. What is a neutral?
5. What is the spectrum?
6. What is color?
7. What is a pigment?
8. What is a complementary?
9. How do we know if a color is complementary?

## THIRTEENTH LESSON

### THREE COLORS IN ANALOGOUS HARMONY, BRILLIANTS

We have now done the complementaries from one to five in brilliants and in grays, using one, two, three, four, and five spectrums in the color combinations. We now come to a part of color combinations which we call analogous harmonies. This is based on using only one-half of a spectrum. Looking at the spectrum chart on Plate I, if we take any set of colors next to each other, not to exceed six, we use just one-half of the spectrum, but if we used the seventh color we would then have the complementary of the first one. This would destroy the analogous harmony and make an unbalanced color combination.

To give a feeling of completeness we must always use three steps or more. Two colors never give this impression.

It would be a very good idea if you would carry a small notebook and pencil and when in the country make small memorandum sketches in outline of trees, hills, water, etc., for use in these designs.

Looking at the design drawn on the upper left-hand corner on chart No. 28 you will color this design in brilliant harmonies of three colors. After you have drawn the other five designs in the spaces left it would be a much better idea now not to refer to Plate XII to get ideas, but to originate them from the sketches that you have made outdoors.

The designs are to be colored as follows:

1. Red, orange, yellow.
2. Orange, yellow, yellowgreen.
3. Yellow, yellowgreen, green.
4. Yellowgreen, green, bluegreen.
5. Green, bluegreen, blue.
6. Bluegreen, blue, blueviolet.
7. Blue, blueviolet, violet.
8. Blueviolet, violet, purple.
9. Violet, purple, crimson.
10. Purple, crimson, scarlet.
11. Crimson, scarlet, red.
12. Scarlet, red, orange.

You will see by this that you can get twelve color combinations instead of only six as we did in the complementary colors. After you have colored the two charts in these harmonies you should make some extra sheets and color them with the brilliant colors, using the 24-color spectrum chart. This can be done in two ways as follows: The first design could be colored in red, orange-red, and orange; the second design in orange-red, orange, and orange-yellow; the third design in orange, orange-yellow, and yellow; the fourth design in yellow, yellowgreen-yellow, and yellowgreen; the fifth design in yellowgreen-yellow, yellowgreen, and yellowgreen-green, etc.—in other words, the color in between each one of the twelve colors on the color-mixing chart, using three hues or colors each time. Another way would be to use the three colors in the 12-color mixing chart, putting the steps in between at the same time. For example, the first design could be in red, orange-red, orange, orange-yellow, and yellow. This would give you five hues, but there would really be only three colors from the 12-color mixing chart. The colors in between would lead in a more gradual way and give us what we call a better *sequence.*

This word SEQUENCE is a very important word to remember as later on when we paint objects with their shadows and lights the half-tones must always be carried in sequence. This will be explained in later lessons.

It is not necessary to put in the brilliant colors always with flat tones, but they can be broken up in the handling, as was explained, by making the diagonal, or the square, or the basket-weave stroke. Of course, you will not use white with any one of these colors, all colors being brilliant as in the first lesson of one color and one complementary.

## QUESTIONNAIRE

1. What is the least number of colors we can have in a harmony?
2. What is the largest number of colors we can have in a 12-color spectrum?
3. What is the largest number of colors we can have in a 24-color spectrum?
4. What is the least number of colors we can have in a 24-color spectrum?

5. If we put seven colors in a 12-color spectrum for a harmony what does it do?

6. Why are three colors better than two in a harmony?

7. Give an example of three colors in harmony, using blue as one color.

8. Give an example of three colors in harmony, using violet as one color.

9. Give an example of three colors in harmony, using red as one color.

## FOURTEENTH LESSON

### Four Colors in Analogous Harmony, Brilliants

This lesson takes up the colors in *sequence* or analogous harmony, using this time four colors instead of three.

The designs should be originated the same as in the last lesson, the design in the upper left-hand corner on chart No. 30 giving you a fair idea of what to put in the other spaces.

The designs should be colored as follows:

1. Red, orange, yellow, yellowgreen.
2. Orange, yellow, yellowgreen, green.
3. Yellow, yellowgreen, green, bluegreen.
4. Yellowgreen, green, bluegreen, blue.
5. Green, bluegreen, blue, blueviolet.
6. Bluegreen, blue, blueviolet, violet.
7. Blue, blueviolet, violet, purple.
8. Blueviolet, violet, purple, crimson.
9. Violet, purple, crimson, scarlet.
10. Purple, crimson, scarlet, red.
11. Crimson, scarlet, red, orange.
12. Scarlet, red, orange, yellow.

Again you see we can make twelve color combinations entirely different in analogous harmonies or sequence, and likewise it is suggested that you make four colors in harmony using the 24-color chart as was explained in the previous lesson by putting the steps in between these colors or by using directly four of the twenty-four colors. By using the 24-color chart with the steps between you would, of course, get twenty-four designs instead of twelve.

## QUESTIONNAIRE

1. What is four colors in analogous harmony?
2. What is sequence?
3. Give an example of four colors in analogous harmony, using red as one of the colors.
4. Give an example of four colors in analogous harmony, using purple as one of the colors.
5. Give an example of four colors in analogous harmony, using yellow as one of the colors.
6. Give an example of four colors in analogous harmony, using blue as one of the colors.

## FIFTEENTH LESSON

### Five Colors in Analogous Harmony, Brilliants

This lesson deals with five colors in the same way as we did with the four colors. The designs should also be landscapes taken from things that you have seen outdoors.

You will be surprised by coloring the things in a conventionalized manner as, of course, this exercise demands. They will be units of color composition and although the sky may be painted with red instead of blue, or the grass with an orange instead of a green, or a cloud in yellow instead of in white, the effect will be very pleasing. Of course, you understand that these color combinations can be used for the decoration of any of the applied arts besides the conventionalized landscape. After drawing the designs on charts Nos. 32 and 33 you will color the designs as follows:

1. Red, orange, yellow, yellowgreen, green.
2. Orange, yellow, yellowgreen, green, bluegreen.
3. Yellow, yellowgreen, green, bluegreen, blue.
4. Yellowgreen, green, bluegreen, blue, blueviolet.
5. Green, bluegreen, blue, blueviolet, violet.
6. Bluegreen, blue, blueviolet, violet, purple.
7. Blue, blueviolet, violet, purple, crimson.
8. Blueviolet, violet, purple, crimson, scarlet.
9. Violet, purple, crimson, scarlet, red.
10. Purple, crimson, scarlet, red, orange.
11. Crimson, scarlet, red, orange, yellow.
12. Scarlet, red, orange, yellow, yellowgreen.

And again we have made twelve different color combinations out of the 12-color spectrum chart. You should again make extra charts, using the 24-color chart as before directed.

## QUESTIONNAIRE

1. What is five colors in analogous harmony?
2. Give an example of five colors in analogous harmony, using green as one of the colors.
3. Give an example of five colors in analogous harmony, starting with orange.
4. Give an example of five colors in analogous harmony, starting with yellow.

5. Give an example of five colors in analogous harmony, starting with violet.

6. Give an example of five colors in analogous harmony, starting with blue.

7. Give an example of five colors in analogous harmony, starting with scarlet.

## SIXTEENTH LESSON

### SIX COLORS IN ANALOGOUS HARMONY, BRILLIANTS

In this lesson we deal with six colors on one side of the spectrum chart. Heretofore we have used only five colors on one side of the spectrum, but here we can use six colors on the 12-color spectrum or twelve colors on the 24-color spectrum. The designs on charts Nos. 34 and 35 should be drawn in and colored as follows:

1. Red, orange, yellow, yellowgreen, green, bluegreen.
2. Orange, yellow, yellowgreen, green, bluegreen, blue.
3. Yellow, yellowgreen, green, bluegreen, blue, blueviolet.
4. Yellowgreen, green, bluegreen, blue, blueviolet, violet.
5. Green, bluegreen, blue, blueviolet, violet, purple.
6. Bluegreen, blue, blueviolet, violet, purple, crimson.
7. Blue, blueviolet, violet, purple, crimson, scarlet.
8. Blueviolet, violet, purple, crimson, scarlet, red.
9. Violet, purple, crimson, scarlet, red, orange.
10. Purple, crimson, scarlet, red, orange, yellow.
11. Crimson, scarlet, red, orange, yellow, yellowgreen.
12. Scarlet, red, orange, yellow, yellowgreen, green.

Here we have again the 12-color combinations, and likewise you can make the twenty-four color combinations the same as you did in the previous lesson.

## QUESTIONNAIRE

1. What is six colors in analogous harmony?
2. What is the largest number of colors we can put in analogous harmony using the 12-color spectrum?
3. Give an example of six colors in analogous harmony, starting with crimson and going around the spectrum clockwise.
4. Give an example of six colors in analogous harmony, starting with purple and going around the spectrum counter-clockwise.
5. Give an example of six colors in analogous harmony, starting with blue.
6. Give an example of six colors in analogous harmony with green and bluegreen as the middle colors.
7. Give an example of six colors in analogous harmony with scarlet and red as the two middle colors.

## SEVENTEENTH LESSON

### Three Colors in Analogous Harmony, Neutralized or Grayed

The next problem we have to work on is analogous harmonies in neutralized or grayed colors. We remember how we neutralized the colors by the mixture of their complementary and by adding white in the grayed complementaries. We do the same thing in analogous harmonies with the exception that we can carry it into six colors as we did in the previous lesson of analogous harmonies in brilliants—again reminding you that when a color is grayed or neutralized it means that you are making a color which does not reflect the full amount of the ray of the spectrum, and is the same as if you took a brilliant color, first exposing it into a brilliant light, next exposing it under a modified light, next exposing it in a place that is darker, and last in a very dark place. We get the effect of this darkened tone by mixing a color with its complementary; although we expose the neutralized color in a bright light we can only get the brilliancy that we had with the brilliant color in a darkened place.

The first of the grays in harmonies should be made as we did in the brilliants, with three colors only, continuing as follows: The first design you will color in red, orange, and yellow. You should use the neutralized colors of A—1, 2, and 3; the orange in the brilliant and tints of o—A, B, C, and D; and the yellow in D—1, 2, and 3. This will make the orange appear the most dominant note in your composition. You can make this in three different methods, either by making the most of the design in yellow, using the other colors in smaller quantities, or you could make most of the design in red and yellow, leaving the orange in small masses, or, again, you could make the larger masses with orange, using the neutralized red and neutralized yellow in the smaller masses, or you could leave all three evenly balanced. So you see you can make, with the same color combination, innumerable effects. After drawing the designs on Charts No. 36 and 37 color the designs as follows:

1. Red, orange, yellow.
2. Orange, yellow, yellowgreen.
3. Yellow, yellowgreen, green.
4. Yellowgreen, green, bluegreen.

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5. Green, bluegreen, blue.
6. Bluegreen, blue, blueviolet.
7. Blue, blueviolet, violet.
8. Blueviolet, violet, purple.
9. Violet, purple, crimson.
10. Purple, crimson, scarlet.
11. Crimson, scarlet, red.
12. Scarlet, red, orange.

You may change the combinations in additional designs—for example, you could use the three colors all in A—1, 2, and 3, or with B—1, 2, and 3, or with 3—A, B, C, and D, etc. You can also use the 24-color spectrum chart as we did in the previous lesson, only this time making all the colors neutralized or in the tints.

## QUESTIONNAIRE

1. How do I make three colors in analogous harmony in neutralized colors?
2. Give an example.
3. How can I make one color in a harmony the most dominant note?
4. Give another way of doing it.
5. How can I make all colors evenly balanced in an analogous harmony?
6. Does our eye make any difference in regard to the impression?
7. Give me an example of three colors in analogous harmony, neutralized, in the 3 tone.
8. Give an example of three colors in analogous harmony, neutralized, in the B line.
9. Give an example of three colors in analogous harmony, neutralized, in the C line.
10. Give an example of three colors in analogous harmony, neutralized, in the D line.

## EIGHTEENTH LESSON

### FOUR COLORS IN ANALOGOUS HARMONY, NEUTRALIZED OR GRAYED

It is time now that we take up a little of composition of form as well as composition of color as we have done in our previous lesson. You will therefore draw a design based on the composition of weight against distance; if you hold a ruler or stick of wood balanced on a finger, the finger will have to be at the center of the ruler to make it balance. This is known as bi-symmetrical balance. Now if you put the weight on one end of the ruler you will have to make one end longer than the end that has the weight. This is known as weight balanced by distance. Drawing five more designs on charts No. 38 and 39 with this in mind we can place a tree on one side about two-thirds to the right, and have distant hills showing on the other side. This will make these designs so that the mass is to the right or to the left of the picture design, leaving the space balance the mass on the other side, as you will see in the printed illustration on this chart.

Color the designs as follows:

1. Red, orange, yellow, yellowgreen.
2. Orange, yellow, yellowgreen, green.
3. Yellow, yellowgreen, green, bluegreen.
4. Yellowgreen, green, bluegreen, blue.
5. Green, bluegreen, blue, blueviolet.
6. Bluegreen, blue, blueviolet, violet.
7. Blue, blueviolet, violet, purple.

8. Blueviolet, violet, purple, crimson.
9. Violet, purple, crimson, scarlet.
10. Purple, crimson, scarlet, red.
11. Crimson, scarlet, red, orange.
12. Scarlet, red, orange, yellow.

Neutralize these colors the same as you did in the previous lesson, and also use the 24-color mixing chart.

## QUESTIONNAIRE

1. Give an example of four colors in analogous harmony, neutralized, using the diagonal of the color-mixing chart.
2. Give an example of four colors in analogous harmony, neutralized, with advancing and receding tones.
3. Give an example of four colors in analogous harmony, neutralized, with advancing and receding tints.
4. Give an example of four colors in analogous harmony, neutralized, using crimson as one of the colors.
5. Give an example of four colors in analogous harmony, neutralized, using violet as one of the colors.
6. Give an example of four colors in analogous harmony, neutralized, using bluegreen as one of the colors.
7. What is weight against distance?
8. What is meant by composition?
9. What is balance?
10. Give an example of four colors in analogous harmony balancing three colors against one.
11. If I have one color brilliant can the other colors, to balance, be grayed or neutralized?

## NINETEENTH LESSON

### FIVE COLORS IN ANALOGOUS HARMONY, NEUTRALIZED OR GRAYED

Taking another compositional form which is known as weight against smaller weight; holding the ruler balanced on the finger, with a large weight on one end and a smaller weight on the other, the end with the small weight will have to be longer than the other end, but not as long as in the previous lesson. This is called weight against smaller weight. Draw the designs in the empty spaces on charts No. 40 and 41 so that the heavy mass is on one side of the picture design and the lighter mass is on the other. The lighter mass will be further away from the center, and the heavy mass nearer to the center.

The designs are to be colored as follows:

1. Red, orange, yellow, yellowgreen, green.
2. Orange, yellow, yellowgreen, green, bluegreen.
3. Yellow, yellowgreen, green, bluegreen, blue.
4. Yellowgreen, green, bluegreen, blue, blueviolet.
5. Green, bluegreen, blue, blueviolet, violet.
6. Bluegreen, blue, blueviolet, violet, purple.
7. Blue, blueviolet, violet, purple, crimson.
8. Blueviolet, violet, purple, crimson, scarlet.
9. Violet, purple, crimson, scarlet, red.
10. Purple, crimson, scarlet, red, orange.
11. Crimson, scarlet, red, orange, yellow.
12. Scarlet, red, orange, yellow, yellowgreen.

Again you have twelve color combinations using the 12-color spectrum, and you can get twenty-four color combinations using the 24-color spectrum.

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## QUESTIONNAIRE

1. What is weight against smaller weight in composition?
2. Give an example of five colors in analogous harmony, neutralized, using red, orange, and yellow against yellowgreen and green, neutralizing some more than others.
3. Give an example of five colors in analogous harmony, neutralized, using green as one of the colors.
4. Give an example of five colors in analogous harmony, neutralized, using blueviolet as one of the colors.
5. Give an example of five colors in analogous harmony, neutralized, using crimson as one of the colors.
6. Give an example of five colors in analogous harmony, neutralized, using scarlet as one of the colors.
7. Give an example of five colors in analogous harmony, neutralized, using red as one of the colors.
8. Give an example of five colors in analogous harmony, neutralized, using the 24-color spectrum chart.

## TWENTIETH LESSON

### SIX COLORS IN ANALOGOUS HARMONY, NEUTRALIZED OR GRAYED

In this lesson we take up still another form of composition; holding the ruler so that the heavy weight is on one end and a number of smaller weights on the other end so as to make an unequal balance. This is known as weight against smaller weight, sub-divided. After drawing the designs on charts No. 42 and 43 color the designs as follows:

1. Red, orange, yellow, yellowgreen, green, bluegreen.
2. Orange, yellow, yellowgreen, green, bluegreen, blue.

3. Yellow, yellowgreen, green, bluegreen, blue, blueviolet.
4. Yellowgreen, green, bluegreen, blue, blueviolet, violet.
5. Green, bluegreen, blue, blueviolet, violet, purple.
6. Bluegreen, blue, blueviolet, violet, purple, crimson.
7. Blue, blueviolet, violet, purple, crimson, scarlet.
8. Blueviolet, violet, purple, crimson, scarlet, red.
9. Violet, purple, crimson, scarlet, red, orange.
10. Purple, crimson, scarlet, red, orange, yellow.
11. Crimson, scarlet, red, orange, yellow, yellowgreen.
12. Scarlet, red, orange, yellow, yellowgreen, green.

Instead of making the same neutralization as we did in the previous analogous harmonies, color one set of designs using A—1, 2, and 3 in all six colors, and in the background or distance use the dead neutral 4D.

By using this dead neutral you will make it appear as if it were made of the complementary color of all the three colors used. It is important that you make this neutral before it is put into the chart, so that it does not really show any color at all. The larger mass of this design should be made with this neutral, and the other colors only as staccato notes. You will see by that that the neutral enhances the value of all the other colors, and, as we have said above, will look as if it were a complementary color to all the colors used, or, as we will know in future, a mutual or split complementary.

## QUESTIONNAIRE

1. Give an example of six colors in analogous harmony, neutralized, using the tints and tones.

2. Give an example of six colors in analogous harmony, neutralized, using crimson as one of the colors.

3. Give an example of six colors in analogous harmony, neutralized, using blueviolet as one of the colors.

4. Give an example of six colors in analogous harmony, neutralized, using green as one of the colors.

5. Giving an example of six colors in analogous harmony, neutralized, using purple as one of the colors.

6. Give an example of six colors in analogous harmony, neutralized, using red as one of the colors.

7. Give an example of using six colors in analogous harmony, neutralized, and a dead neutral as the background or as the spot of color.

## THIRD SECTION

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## TWENTY-FIRST LESSON

### Two Colors and One Mutual Complementary

We now come to a part of the color exercises which is a combination of all that has gone before. We learned that one color and one complementary used one spectrum, two colors and two complementaries used two spectrums, three colors and three complementaries used three spectrums, etc., and we learned that harmonies were one-half of the spectrum, and now we come to a color combination known as split complementaries. In this classification of color combinations which is known as split complementaries, we must imagine that we take two or more spectrums, but instead of dividing them as we did in the regular complementaries in two equal divisions we now divide them in two *unequal* divisions. For example, the color combination known as "two colors against one mutual complementary"—starting with the red and the orange as the two colors the mutual complementary would be a color known as blueviolet-blue or violet-blue. Taking two spectrums one of which we divide in red and blue, the other into orange and blueviolet as we did in the regular complementaries, but instead of leaving the blueviolet and blue separate we throw the two rays together, which would make a color known as blueviolet-blue or violet-blue, which is shown in the 24-color spectrum chart on Plate III.

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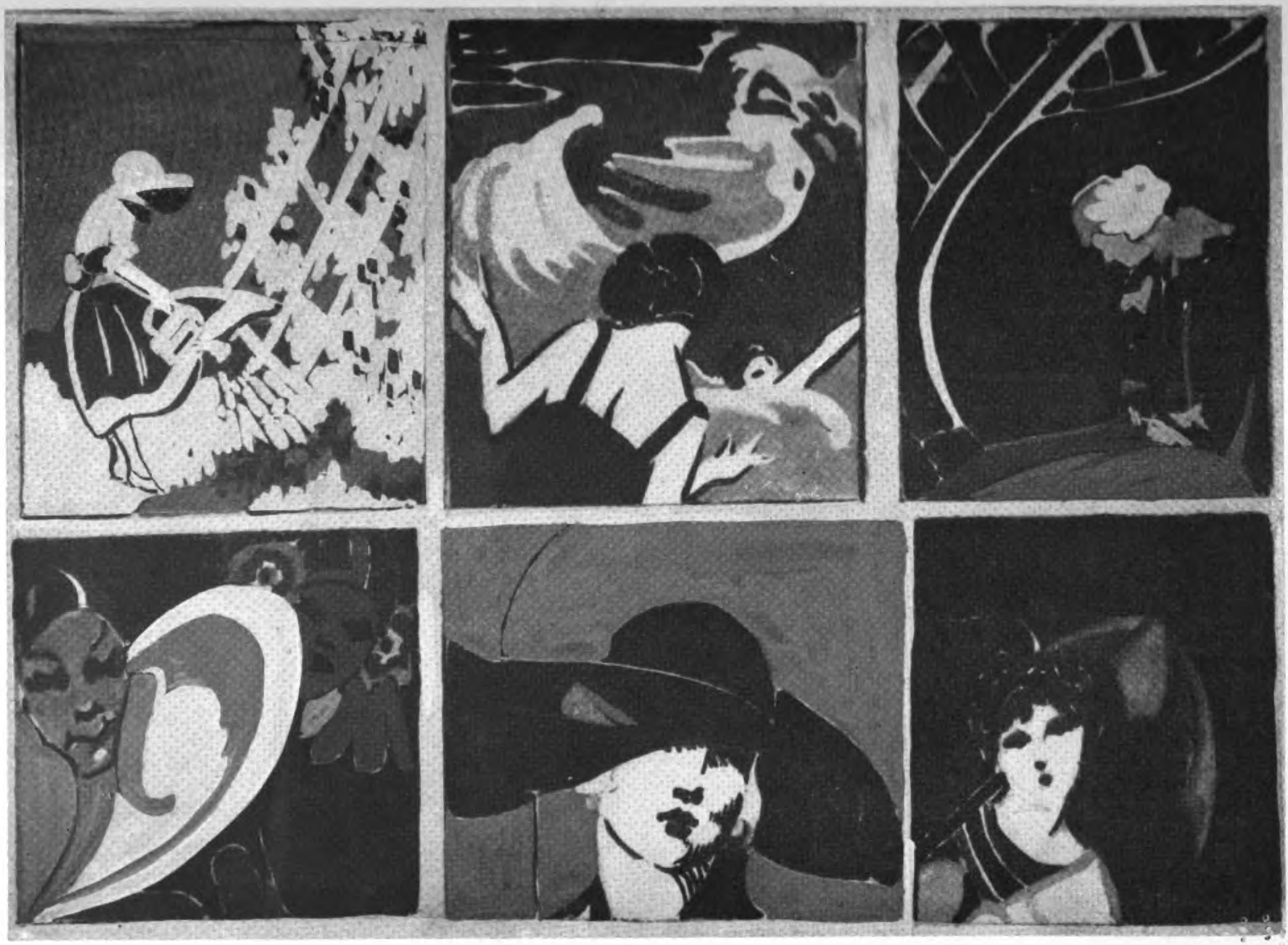
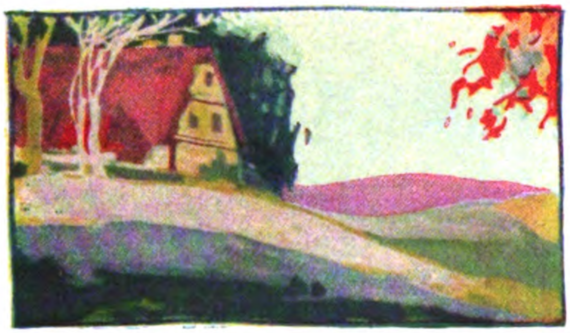


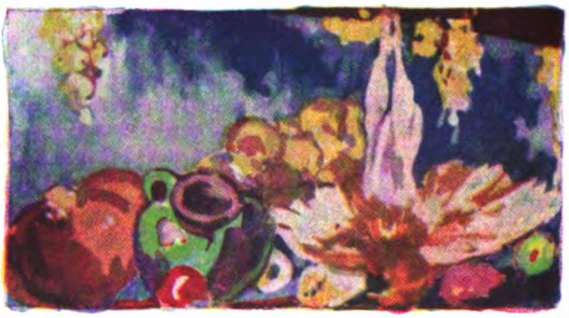
Plate XIII



Five colors and three mutual complementaries

red, orange, yellow, yellow-green, green

blue-violet, violet, purple

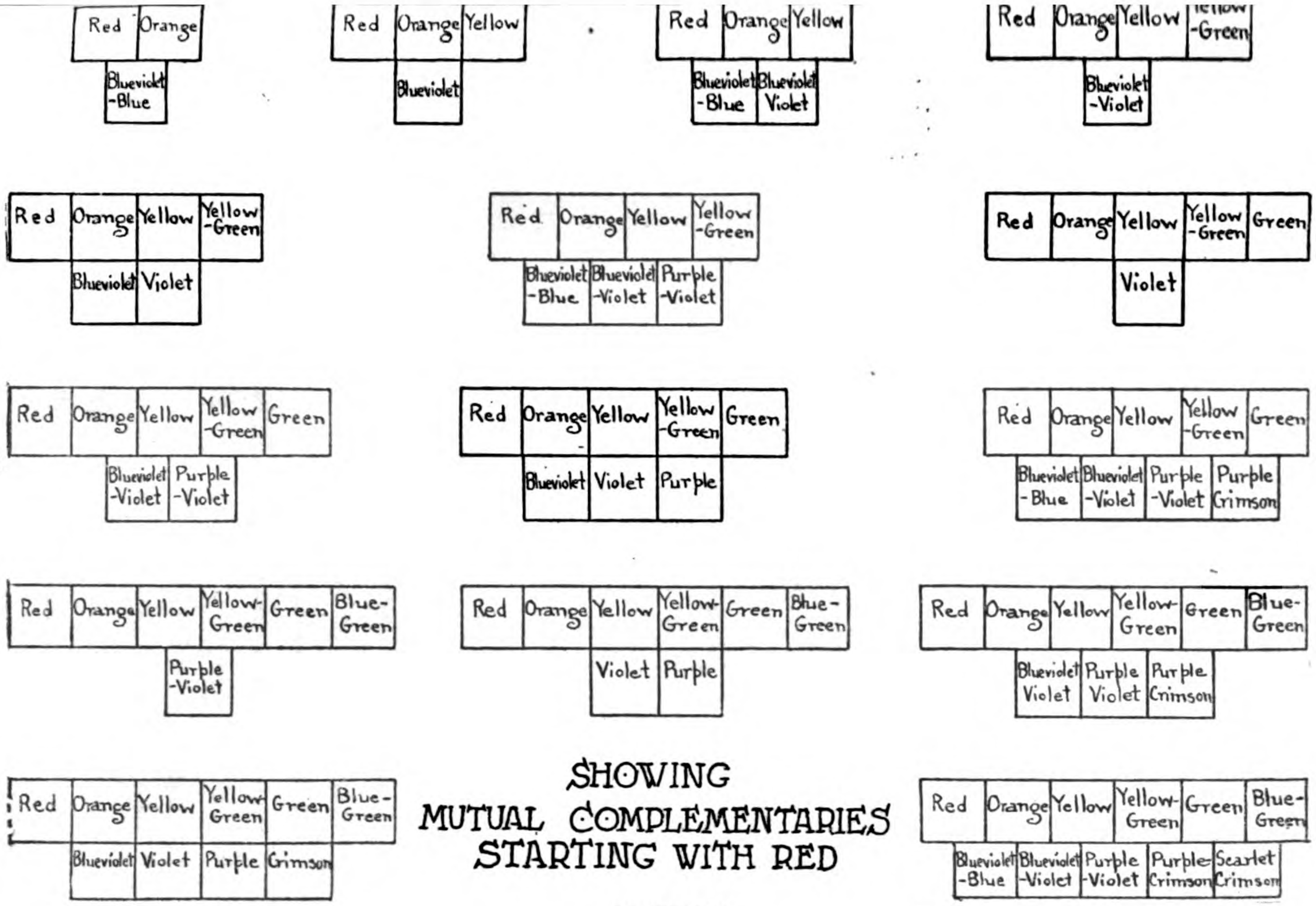


Six colors and five mutual complementaries

yellow, yellow-green, green, blue-green, blue, blue-violet

violet-purple, purple-crimson, crimson-scarlet, scarlet-red, red-orange

PLATE XIV


Red Orange
Blueviolet-Blue
Red Orange Yellow
Blueviolet
Red Orange Yellow
Blueviolet-Blue Blueviolet Violet
Red Orange Yellow Yellow-Green
Blueviolet-Violet
Red Orange Yellow Yellow-Green
Blueviolet Violet
Red Orange Yellow Yellow-Green
Blueviolet-Blue Blueviolet-Violet Purple-Violet
Red Orange Yellow Yellow-Green Green
Violet
Red Orange Yellow Yellow-Green Green
Blueviolet-Violet Purple-Violet
Red Orange Yellow Yellow-Green Green
Blueviolet Violet Purple
Red Orange Yellow Yellow-Green Green
Blueviolet-Blue Blueviolet-Violet Purple-Violet Purple Crimson
Red Orange Yellow Yellow-Green Green Blue-Green
Purple-Violet
Red Orange Yellow Yellow-Green Green Blue-Green
Violet Purple
Red Orange Yellow Yellow-Green Green Blue-Green
Blueviolet Violet Purple Violet Purple Crimson
Red Orange Yellow Yellow-Green Green Blue-Green
Blueviolet Violet Purple Crimson
Red Orange Yellow Yellow-Green Green Blue-Green
Blueviolet-Blue Blueviolet-Violet Purple-Violet Purple-Crimson Scarlet Crimson

SHOWING
MUTUAL COMPLEMENTARIES
STARTING WITH RED

PLATE XV

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Remember that the three rays of the spectrum are red, green, and violet, and the yellow is made up of the combined rays of red and green, the blue is made up of the green and the violet, the crimson is made up of the violet and red, and likewise reminding you that the orange is made up of all the red rays with just a little of the green rays, the yellowgreen is made up of all the green rays and a very little of the red rays, the bluegreen is made up of all the green rays and very little of the violet rays, the blueviolet is made up of all the violet rays and very little of the green rays, the purple is made up of all the violet rays and very little of the red rays, and the scarlet is made up of all the red rays with very little of the violet rays. This is repeated from the previous lessons to remind you of what each color is composed.

The student will readily understand the system after once getting the idea of this first split complementary, and the rest of the split complementaries will appear very simple.

Now instead of making the mutual complementary brilliant, if we were to neutralize it we would have to use its own complementary which would be a red-orange or orange-red as shown in the 24-color spectrum on Plates II and III, and as we know that blueviolet-blue is complementary to the orange-red we mix a little of this with the blueviolet-blue—just enough to take away the brilliancy, or perhaps we add white, and we make the red and the orange more brilliant by having their mutual complementary grayed or neutralized or in tint.

We therefore draw some more designs in the spaces left on charts No. 44 and 45. Instead of making these conventionalized landscapes we now use the human figure, buildings, and animals as a means of composition. Some of these designs can be covers for magazines, books, or illustrations, also giving compositions for portrait, figure painting, and landscapes. Color the designs as follows:

1. Red and orange with blueviolet-blue.
2. Orange and yellow with blueviolet-violet.
3. Yellow and yellowgreen with purple-violet.
4. Yellowgreen and green with purple-crimson.
5. Green and bluegreen with scarlet-crimson.
6. Bluegreen and blue with scarlet-red.
7. Blue and blueviolet with orange-red.
8. Blueviolet and violet with orange-yellow.
9. Violet and purple with yellowgreen-yellow.
10. Purple and crimson with yellowgreen-green.
11. Crimson and scarlet with bluegreen-green.
12. Scarlet and red with bluegreen-blue.

We have now twelve color combinations by using a combination of the 12-color mixing chart with the 24-color mixing chart; as you will notice one of the colors of the 24-color mixing chart is complementary to two colors of the 12-color mixing chart.

You can make the mutual complementary in brilliant or in gray, and you will therefore make some extra charts and color some with the brilliant colors and other charts with all neutralized colors in A—1, 2, and 3, and some with B—1, 2, and 3, C—1, 2, and 3, and D—1, 2, and 3, and any of the other neutralized or tint combinations which of course are too numerous to mention, but the more you use of these grayed or neutralized colors in the combinations, as described in lessons 8 to 12, the more astounded you will be by the possibilities of color combinations and compositions, and the totally different effect you will get by using the different shades and tints.

A color recedes as you neutralize it or add white to make tints, as was described in lesson 8, so you will put the grayed or neutralized color in the distance, and the more brilliant or more intense value in the foreground.

## QUESTIONNAIRE

1. What is a split complementary?
2. What is a mutual complementary?
3. What do we do when we make one color against two?
4. What is the difference between one against two and two against one?
5. When do we throw two rays together to make one color?
6. Why is a split color complementary?
7. Give an example of the mutual complementary of red and orange.
8. What are the two colors complementary to blueviolet-blue?
9. What are the two colors complementary to bluegreen-green?
10. What are the two colors complementary to orange-yellow?
11. What are the two colors complementary to yellowgreen-green?
12. Can I neutralize the mutual complementary?
13. How do I do this?

## TWENTY-SECOND LESSON

### Three Colors and One Mutual Complementary

In the previous lesson we took two colors and one mutual complementary. In this lesson we have to deal with three colors with one mutual complementary, and again we take three spectrums, and as an example taking the red, orange, and yellow—from these spectrums we would have three complementaries of blue, blueviolet, and violet. Taking up the question of quantitative color design, if we throw these rays together we would have a blueviolet ray which in itself would be more brilliant on account of the three spectrums being used to produce it. Having this knowledge would lead us to believe, with a mutual complementary of one against three, that the complementary should either be more brilliant than the other three or should occupy a larger space in the design if neutralized, and this is a very good hypothesis to work upon for the quantitative theory of color masses.

We therefore say that blueviolet is a mutual or split complementary to red, orange, and yellow. After drawing in the rest of the designs on charts No. 46 and 47 you will color them as follows:

1. Red, orange, yellow with blueviolet.
2. Orange, yellow, yellowgreen with violet.
3. Yellow, yellowgreen, green with purple.
4. Yellowgreen, green, bluegreen with crimson.
5. Green, bluegreen, blue with scarlet.
6. Bluegreen, blue, blueviolet with red.

7. Blue, blueviolet, violet with orange.
8. Blueviolet, violet, purple with yellow.
9. Violet, purple, crimson with yellowgreen.
10. Purple, crimson, scarlet with green.
11. Crimson, scarlet, red with bluegreen.
12. Scarlet, red, orange with blue.

Again we have twelve color combinations. You will gray the mutual complementary as you did in the previous lesson, and also make some extra charts neutralized or with tints with different intensities of your own selection, as it is not necessary now for the advanced pupil to have the tints and shades enumerated. Many charts can be done, each one of interest and furthering your knowledge of color.

## QUESTIONNAIRE

1. What is three colors with one mutual complementary?
2. Why does quantitative color in a design count?
3. Give an example of three colors with one mutual complementary, one color of which is red.
4. Give an example of three colors with one mutual complementary, one color of which is yellow.
5. Give an example of three colors with one mutual complementary, one color of which is violet.
6. Give an example of three colors with one mutual complementary, one color of which is scarlet.

## TWENTY-THIRD LESSON

### THREE COLORS AND TWO MUTUAL COMPLEMENTARIES

Taking the color combination known as three colors against two mutual complementaries, we would have to take again three spectrum charts, and taking the red, orange, and yellow as the first example would give us their three complementaries of blue, blueviolet, and violet. Now instead of throwing these three rays into one ray as we did in the previous lesson we throw the blue on to half of the blueviolet, which would make a blueviolet-blue or violet-blue as we did in two colors against one complementary, and the violet on the other half of the blueviolet which would make blueviolet-violet—so we say that red, orange, and yellow have two mutual or split complementaries of blueviolet-violet and blueviolet-blue. The names of these colors could be better understood if you referred to the 24-color spectrum chart on Plate III.

After drawing the rest of the designs on charts No. 48 and 49 you will color them as follows:

1. Red, orange, yellow with blueviolet-blue and blueviolet-violet.
2. Orange, yellow, yellowgreen with blueviolet-violet and purple-violet.
3. Yellow, yellowgreen, green with purple-violet and purple-crimson.
4. Yellowgreen, green, bluegreen with purple-crimson and scarlet-crimson.
5. Green, bluegreen, blue with scarlet-crimson and scarlet-red.

6. Bluegreen, blue, blueviolet with scarlet-red and orange-red.
7. Blue, blueviolet, violet with orange-red and orange-yellow.
8. Blueviolet, violet, purple with orange-yellow and yellow-green-yellow.
9. Violet, purple, crimson with yellowgreen-yellow and yellowgreen-green.
10. Purple, crimson, scarlet with yellowgreen-green and bluegreen-green.
11. Crimson, scarlet, red with bluegreen-blue and blueviolet-blue.
12. Scarlet, red, orange with bluegreen-blue and blueviolet-blue.

Again we have twelve color combinations. Numbers of charts should be made so as to use the different grays or neutralized tones and tints, as well as using the 24-color spectrum.

## QUESTIONNAIRE

1. What is meant by three colors and two mutual complementaries?
2. How many spectrums do we use in making this combination.
3. Give an example of three colors and two mutual complementaries, one color of which is yellowgreen.
4. Give an example of three colors and two mutual complementaries, one color of which is scarlet-crimson.
5. Give an example of three colors and two mutual complementaries, one color of which is blue.
6. Give an example of three colors and two mutual complementaries, one color of which is yellow.

## TWENTY-FOURTH LESSON

### FOUR COLORS AND ONE MUTUAL COMPLEMENTARY

Continuing on the mutual or split complementaries we come to a color combination known as four colors against one mutual complementary. If we took the red, orange, yellow, and yellowgreen we would have their complementaries of blue, blueviolet, violet, and purple. This would mean that we had taken four spectrums and instead of dividing them up as we did in the previous lesson we throw them all into one which would give us a blueviolet-violet. This is practically the same as the complementary of two colors against one mutual complementary, in the first lesson of this section. We have simply added one color on to each end, and their complementaries, if mixed together, would produce the same as the two center colors.

After filling in the designs on charts No. 50 and 51 you will color them as follows:

1. Red, orange, yellow, yellowgreen with blueviolet-violet.
2. Orange, yellow, yellowgreen, green with purple-violet.
3. Yellow, yellowgreen, green, bluegreen with purple-crimson.
4. Yellowgreen, green, bluegreen, blue with scarlet-crimson.
5. Green, bluegreen, blue, blueviolet with scarlet-red.
6. Bluegreen, blue, blueviolet, violet with orange-red.
7. Blue, blueviolet, violet, purple with orange-yellow.
8. Blueviolet, violet, purple, crimson with yellowgreen-yellow.
9. Violet, purple, crimson, scarlet with yellowgreen-green.
10. Purple, crimson, scarlet, red with bluegreen-green.
11. Crimson, scarlet, red, orange with bluegreen-blue.
12. Scarlet, red, orange, yellow with blueviolet-blue.

Here we have again twelve color combinations in the split complementaries, and now we make some extra designs, coloring them in the same color combinations but using different degrees of the shades and tints. Many of these exercises can be done in the same manner as in the previous lesson.

## QUESTIONNAIRE

1. What is four colors and one mutual complementary?
2. How many spectrums do we use in making this combination?
3. Give an example of four colors and one mutual complementary, one color of which is yellowgreen.
4. Give an example of four colors and one mutual complementary, one color of which is purple.
5. Give an example of four colors and one mutual complementary, one color of which is blueviolet.
6. Give an example of four colors and one mutual complementary, one color of which is blueviolet-blue.
7. Give an example of four colors and one mutual complementary, one color of which is bluegreen-green.
8. Give an example of four colors and one mutual complementary, one color of which is yellowgreen-green.

## TWENTY-FIFTH LESSON

### FOUR COLORS AND TWO MUTUAL COMPLEMENTARIES

Again taking red, orange, yellow, and yellowgreen as four colors for which we wish to find, this time, two mutual complementaries. Now if we take four spectrums we would have their four complementaries of blue, blueviolet, violet, and purple, and instead of throwing all into one to make the one mutual complementary, we divide them into two equal parts—this would give blueviolet and violet, so we say that blueviolet and violet are the mutual complementaries of red, orange, yellow, and yellowgreen.

As was said before, if you will master the theory of two colors and one complementary and three colors with one complementary you will be able to adapt all of the split complementaries; as was said, all you do in the future split complementaries is add on one color to each end, so that it is very important that you master the first two lessons in this section. You see that these two center complementaries of the four against two is simply taking the complementaries of the two middle colors as we did in the three colors with one mutual complementary.

You will fill in the spaces on charts No. 52 and 53 and color them as follows:

1. Red, orange, yellow, yellowgreen with blueviolet and violet.
2. Orange, yellow, yellowgreen, green with violet and purple.
3. Yellow, yellowgreen, green, bluegreen with purple and crimson.
4. Yellowgreen, green, bluegreen, blue with crimson and scarlet.
5. Green, bluegreen, blue, blueviolet with scarlet and red.
6. Bluegreen, blue, blueviolet, violet with red and orange.
7. Blue, blueviolet, violet, purple with orange and yellow.
8. Blueviolet, violet, purple, crimson with yellow and yellowgreen.
9. Violet, purple, crimson, scarlet with yellowgreen and green.
10. Purple, crimson, scarlet, red with green and bluegreen.
11. Crimson, scarlet, red, orange with bluegreen and blue.
12. Scarlet, red, orange, yellow with blue and blueviolet.

And again having made twelve color combinations, we make some extra designs, coloring them in the same color combinations but using different degrees of the shades and tints. All of these exercises can be done in the same manner as in the previous lesson.

## QUESTIONNAIRE

1. How many spectrums do we use in four colors and two mutual complementaries?
2. Why is it important to master first three colors against one and two colors against one in mutual complementaries?
3. What similarity is there between these two color combinations and all other split or mutual complementaries?
4. Give an example of four colors and two mutual complementaries, using orange as one of the colors.
5. Give an example of four colors and two mutual complementaries, using yellow as one of the colors.
6. Give an example of four colors and two mutual complementaries, using crimson as one of the colors.
7. Give an example of four colors and two mutual complementaries, using blueviolet as one of the colors.
8. Give an example of four colors and two mutual complementaries, using bluegreen as one of the colors.
9. Give an example of four colors and two mutual complementaries, using scarlet as one of the colors.

## TWENTY-SIXTH LESSON

### Four Colors and Three Mutual Complementaries

Taking red, orange, yellow, and yellowgreen again, and this time making three mutual complementaries instead of two complementaries as we did in the previous lesson. This time we wish to find three mutual complementaries, and of course we take four spectrums again and we find that the complementaries are blue, blueviolet, violet, and purple, and this time instead of dividing them in half we divide them into three equal parts. This would give us the three mutual or split complementaries known as blueviolet-blue, blueviolet-violet, and purple-violet.

After completing the charts No. 54 and 55 with the designs in figure composition we color these designs as follows:

1. Red, orange, yellow, yellowgreen with blueviolet-blue, blueviolet-violet, purple-violet.
2. Orange, yellow, yellowgreen, green with blueviolet-violet, purple-violet, purple-crimson.
3. Yellow, yellowgreen, green, bluegreen with purple-violet, purple-crimson, scarlet-crimson.
4. Yellowgreen, green, bluegreen, blue with purple-crimson, scarlet-crimson, scarlet-red.
5. Green, bluegreen, blue, blueviolet with scarlet-crimson, scarlet-red, orange-red.
6. Bluegreen, blue, blueviolet, violet with scarlet-red, orange-red, orange-yellow.
7. Blue, blueviolet, violet, purple with orange-red, orange-yellow, yellowgreen-yellow.
8. Blueviolet, violet, purple, crimson with orange-yellow, yellowgreen-yellow, yellowgreen-green.
9. Violet, purple, crimson, scarlet with yellowgreen-yellow, yellowgreen-green, bluegreen-green.
10. Purple, crimson, scarlet, red with yellowgreen-green, bluegreen-green, bluegreen-blue.
11. Crimson, scarlet, red, orange with bluegreen-green, bluegeeen-blue, blueviolet-blue.
12. Scarlet, red, orange, yellow with bluegreen-blue, blueviolet-blue, blueviolet-violet.

Here again we have twelve distinct color combinations which can be made in all brilliant colors, using the three colors in brilliants and the four colors in grays. If this is done the three brilliants should be in smaller masses, or we could have the four colors in brilliants and the three colors in gray or neutralized colors or tints—in this case the grays should be in larger areas. Many extra charts can be made to give you a better idea of the possibilities of this color combination.

## QUESTIONNAIRE

1. How many spectrums do we use when we have four colors with three mutual complementaries?

2. Give an example of four colors and three mutual complementaries, one color of which is red.

3. Give an example of four colors and three mutual complementaries, one color of which is blueviolet.

4. Give an example of four colors and three mutual complementaries, one color of which is purple.

5. Give an example of four colors and three mutual complementaries, one color of which is orange-yellow.

6. Give an example of four colors and three mutual complementaries, one color of which is yellowgreen-yellow.

7. Give an example of four colors and three mutual complementaries, one color of which is blueviolet-violet.

8. Give an example of four colors and three mutual complementaries, one color of which is bluegreen-green.

## TWENTY-SEVENTH LESSON

### Five Colors and One Mutual Complementary

Taking the five colors, red, orange, yellow, yellowgreen, and green—to find out one color which would be a mutual complementary to all colors combined would be the same as if we took five spectrum charts, and their regular complementaries would be blue, blueviolet, violet, purple, and crimson. If we combined all these rays into one color we would have a violet, so we say that violet is a mutual or split complementary to red, orange, yellow, yellowgreen, and green.

Drawing in the designs on charts No. 56 and 57 you will color them as follows:

1. Red, orange, yellow, yellowgreen, green with violet.
2. Orange, yellow, yellowgreen, green, bluegreen with purple.
3. Yellow, yellowgreen, green, bluegreen, blue with crimson.
4. Yellowgreen, green, bluegreen, blue, blueviolet with scarlet.
5. Green, bluegreen, blue, blueviolet, violet with red.
6. Bluegreen, blue, blueviolet, violet, purple with orange.
7. Blue, blueviolet, violet, purple, crimson with yellow.
8. Blueviolet, violet, purple, crimson, scarlet with yellowgreen.
9. Violet, purple, crimson, scarlet, red with green.
10. Purple, crimson, scarlet, red, orange with bluegreen.
11. Crimson, scarlet, red, orange, yellow with blue.
12. Scarlet, red, orange, yellow, yellowgreen with blueviolet.

Again we have twelve color combinations. Besides making the charts to be put in the book you will again make extra charts and color these with all the shades and tints as you did in the previous lessons, remembering again that as the mutual complementary color is a combination of all the rays of the complementaries of all the other colors, it either should be a brilliant tone, or in larger masses if in the neutralized color, to make an even balance.

Still another way would be to make the entire picture or design in the five colors, using the mutual complementary as a staccato note.

### QUESTIONNAIRE

1. How may spectrums do you use when you have five colors against one mutual complementary?
2. Give an example of five colors and one mutual complementary, one color of which is yellow.
3. Give an example of five colors and one mutual complementary, one color of which is purple.
4. Give an example of five colors and one mutual complementary, one color of which is green.
5. Give an example of five colors and one mutual complementary, one color of which is crimson.
6. Give an example of five colors and one mutual complementary, one color of which is orange.

## TWENTY-EIGHTH LESSON

### FIVE COLORS AND TWO MUTUAL COMPLEMENTARIES

To find out the two colors which would be mutually complementary would be the same as taking five spectrums, and taking again the colors, red, orange, yellow, yellowgreen, and green, their regular complementaries should be blue, blueviolet, violet, purple, and crimson. Instead of putting these rays together in one color we divide it into two equal parts, and we get two colors—one, blueviolet-violet, and the other, purple-violet.

Drawing in the designs on charts No. 58 and 59, color them as follows:

1. Red, orange, yellow, yellowgreen, green with blueviolet-violet and purple-violet.
2. Orange, yellow, yellowgreen, green, bluegreen with purple-violet and purple-crimson.
3. Yellow, yellowgreen, green, bluegreen, blue with purple-crimson and scarlet-crimson.
4. Yellowgreen, green, bluegreen, blue, blueviolet with scarlet-crimson and scarlet-red.
5. Green, bluegreen; blue, blueviolet, violet with scarlet-red and orange-red.
6. Bluegreen, blue, blueviolet, violet, purple with orange-red and orange-yellow.
7. Blue, blueviolet, violet, purple, crimson with orange-yellow and yellowgreen-yellow.
8. Blueviolet, violet, purple, crimson, scarlet with yellow-green-yellow and yellowgreen-green.
9. Violet, purple, crimson, scarlet, red with yellowgreen-green and bluegreen-green.
10. Purple, crimson, scarlet, red, orange with bluegreen-green and bluegreen-blue.
11. Crimson, scarlet, red, orange, yellow with bluegreen-blue and blueviolet-blue.
12. Scarlet, red, orange, yellow, yellowgreen with blueviolet-blue and blueviolet-violet.

And again we have twelve color combinations with split complementaries, and these likewise should be done in all the shades and tints as in the previous lesson, again

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calling your attention to the distribution of colors in masses, as explained.

## QUESTIONNAIRE

1. How many spectrums do you use when you have five colors against two mutual complementaries?
2. Give an example of five colors and two mutual complementaries, one color of which is orange.
3. Give an example of five colors and two mutual complementaries, one color of which is yellowgreen.
4. Give an example of five colors and two mutual complementaries, one color of which is bluegreen.
5. Give an example of five colors and two mutual complementaries, one color of which is blueviolet.
6. Give an example of five colors and two mutual complementaries, one color of which is purple.

## TWENTY-NINTH LESSON

### FIVE COLORS AND THREE MUTUAL COMPLEMENTARIES

The next combination of colors is known as five colors with three mutual or split complementaries. This is the same as if we took five spectrum charts and divided up the complementaries, instead of in two equal parts, into three equal parts. Taking as an example the red, orange, yellow, yellowgreen, and green as the five colors, the three mutual complementaries would be blueviolet, violet, and purple.

After completing the drawing on charts No. 60 and 61 color the designs as follows:

1. Red, orange, yellow, yellowgreen, green with blueviolet, violet, purple.

2. Orange, yellow, yellowgreen, green, bluegreen with violet, purple, crimson.

3. Yellow, yellowgreen, green, bluegreen, blue with purple, crimson, scarlet.

4. Yellowgreen, green, bluegreen, blue, blueviolet with crimson, scarlet, red.

5. Green, bluegreen, blue, blueviolet, violet with scarlet, red, orange.

6. Bluegreen, blue, blueviolet, violet, purple with red, orange, yellow.

7. Blue, blueviolet, violet, purple, crimson with orange, yellow, yellowgreen.

8. Blueviolet, violet, purple, crimson, scarlet with yellow, yellowgreen, green.

9. Violet, purple, crimson, scarlet, red with yellowgreen, green, bluegreen.

10. Purple, crimson, scarlet, red, orange with green, bluegreen, blue.

11. Crimson, scarlet, red, orange, yellow with bluegreen, blue, blueviolet.

12. Scarlet, red, orange, yellow, yellowgreen with blue, blueviolet, violet.

And again we have twelve color combinations. Remember that we must practice so as to make these in the shades and tints.

## QUESTIONNAIRE

1. How many spectrums do you use when you have five colors against three mutual complementaries?

2. Give an example of five colors and three mutual complementaries, one color of which is scarlet.

3. Give an example of five colors and three mutual complementaries, one color of which is red.

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4. Give an example of five colors and three mutual complementaries, one color of which is yellowgreen.

5. Give an example of five colors and three mutual complementaries, one color of which is blueviolet.

6. Give an example of five colors and three mutual complementaries, one color of which is yellow.

## THIRTIETH LESSON

### FIVE COLORS AND FOUR MUTUAL COMPLEMENTARIES

This is the same as if we took five spectrums and instead of dividing the regular complementaries into three equal parts as we did in the previous lesson we divide the rays into four equal parts. Taking as an example, red, orange, yellow, yellowgreen, and green, the complementary colors would be blueviolet-blue, blueviolet-violet, purple-violet, and purple-crimson.

After completing the drawing on charts No. 62 and 63 you will color these designs as follows:

1. Red, orange, yellow, yellowgreen, green with blueviolet-blue, blueviolet-violet, purple-violet, purple-crimson.

2. Orange, yellow, yellowgreen, green, bluegreen with blueviolet-violet, purple-violet, purple-crimson, scarlet-crimson.

3. Yellow, yellowgreen, green, bluegreen, blue with purple-violet, purple-crimson, scarlet-crimson, scarlet-red.

4. Yellowgreen, green, bluegreen, blue, blueviolet with purple-crimson, scarlet-crimson, scarlet-red, orange-red.

5. Green, bluegreen, blue, blueviolet, violet with scarlet-crimson, scarlet-red, orange-red, orange-yellow.

6. Bluegreen, blue, blueviolet, violet, purple with scarlet-red, orange-red, orange-yellow, yellowgreen-yellow.

7. Blue, blueviolet, violet, purple, crimson with orange-red, orange-yellow, yellowgreen-yellow, yellowgreen-green.

8. Blueviolet, violet, purple, crimson, scarlet with orange-yellow, yellowgreen-yellow, yellowgreen-green, bluegreen-green.

9. Violet, purple, crimson, scarlet, red with yellowgreen-yellow, yellowgreen-green, bluegreen-green, bluegreen-blue.

10. Purple, crimson, scarlet, red, orange with yellowgreen-green, bluegreen-green, bluegreen-blue, blueviolet-blue.

11. Crimson, scarlet, red, orange, yellow with bluegreen-green, bluegreen-blue, blueviolet-blue, blueviolet-violet,

12. Scarlet, red, orange, yellow, yellowgreen with bluegreen-blue, blueviolet-blue, blueviolet-violet, purple-violet.

And again we have twelve color combinations which can be made in all the shades and tints as you have done in the other lessons.

## QUESTIONNAIRE

1. How many spectrums do you use when you have five colors against four mutual complementaries?

2. Give an example of five colors and four mutual complementaries, one color of which is green.

3. Give an example of five colors and four mutual complementaries, one color of which is scarlet-red.

4. Give an example of five colors and four mutual complementaries, one color of which is orange-red.

5. Give an example of five colors and four mutual complementaries, one color of which is orange-yellow.

6. Give an example of five colors and four mutual complementaries, one color of which is yellowgreen.

## THIRTY-FIRST LESSON

### Six Colors and One Mutual Complementary

This exercise starts with the last classification of the split complementaries. Taking up the first exercise of six colors against one mutual complementary, it is the same as if we took six spectrums and taking all the complementaries throw them into one as we did with the five spectrums. Let us take as an example red, orange, yellow, yellowgreen, green, bluegreen—as long as we keep within six we have not made a complementary with any one color; however, if we added a seventh color *in sequence* we would have added the complementary of the first one. Instead we find out what the color of the mutual complementary is of all six colors combined. We know that the complementaries of all six colors are blue, blueviolet, violet, purple, crimson, scarlet—throwing all these rays of light into the center color gives us a color known as purple-violet. This is practically the same color as would have been used in two against one with the yellow and yellow-green, as their mutual complementary was also purple-violet. This is easily explained when you come to think that each end or added color would make this purple-violet. For example, if you mixed the complementary of orange which is blueviolet, and the complementary of green which is crimson you would make a purple-violet, and if you mixed the complementary of red which is blue, and the complementary of bluegreen which is scarlet you would also make a purple-violet, that is, of course, using the rays of light as a means of getting our complementary. As I said before it is very important to remember the first three lessons in the split complementaries, namely, one against two, one against three, two against three, as they are the key to all the mutual complementaries.

After filling in the designs on charts No. 64 and 65, and making extra charts as we did before, you will color the designs as follows:

1. Red, orange, yellow, yellowgreen, green, bluegreen with purple-violet.
2. Orange, yellow, yellowgreen, green, bluegreen, blue with purple-crimson.
3. Yellow, yellowgreen, green, bluegreen, blue, blueviolet with scarlet-crimson.
4. Yellowgreen, green, bluegreen, blue, blueviolet, violet with scarlet-red.
5. Green, bluegreen, blue, blueviolet, violet, purple with orange-red.
6. Bluegreen, blue, blueviolet, violet, purple, crimson with orange-yellow.
7. Blue, blueviolet, violet, purple, crimson, scarlet with yellowgreen-yellow.
8. Blueviolet, violet, purple, crimson, scarlet, red with yellowgreen-green.
9. Violet, purple, crimson, scarlet, red, orange with bluegreen-green.
10. Purple, crimson, scarlet, red, orange, yellow with bluegreen-blue.
11. Crimson, scarlet, red, orange, yellow, yellowgreen with blueviolet-blue.
12. Scarlet, red, orange, yellow, yellowgreen, green with blueviolet-violet.

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Again we have twelve designs, with six colors against one mutual complementary. As we have noted before, the mass or distribution of color can be done in numbers of different ways, either by making the mutual complementary in the neutralized tones or tints in large masses or else in smaller masses in more brilliant color than the six mutual complementaries, or we can gray the six colors and also gray the one mutual complementary, but of course not so much that the single color will be more brilliant or in larger area.

## QUESTIONNAIRE

1. How many spectrums do you use when you have six colors against one mutual complementary?

2. Give an example of six colors and one mutual complementary, one color of which is orange-red.

3. Give an example of six colors and one mutual complementary, one color of which is orange.

4. Give an example of six colors and one mutual complementary, one color of which is purple.

5. Give an example of six colors and one mutual complementary, one color of which is bluegreen-blue.

6. Give an example of six colors and one mutual complementary, one color of which is scarlet.

## THIRTY-SECOND LESSON

### Six Colors and Two Mutual Complementaries

In this exercise, the same as in the previous one, we take six spectrums, and instead of throwing all the complementary colors into one we divide them into two equal parts. Taking as an example red, orange, yellow, yellowgreen, green, bluegreen, their complementaries would be blue, blueviolet, violet, purple, crimson, scarlet. If we throw these rays into two equal parts we get two colors known as violet and purple.

After completing the drawing of the designs on charts No. 66 and 67 you will draw extra charts as you have done previously. Color the designs as follows:

1. Red, orange, yellow, yellowgreen, green, bluegreen with violet and purple.
2. Orange, yellow, yellowgreen, green, bluegreen, blue with purple and crimson.
3. Yellow, yellowgreen, green, bluegreen, blue, blueviolet with crimson and scarlet.
4. Yellowgreen, green, bluegreen, blue, blueviolet, violet with scarlet and red.
5. Green, bluegreen, blue, blueviolet, violet, purple with red and orange.
6. Bluegreen, blue, blueviolet, violet, purple, crimson with orange and yellow.
7. Blue, blueviolet, violet, purple, crimson, scarlet with yellow and yellowgreen.
8. Blueviolet, violet, purple, crimson, scarlet, red with yellowgreen and green.
9. Violet, purple, crimson, scarlet, red, orange with green and bluegreen.
10. Purple, crimson, scarlet, red, orange, yellow with bluegreen and blue.
11. Crimson, scarlet, red, orange, yellow, yellowgreen with blue and blueviolet.
12. Scarlet, red, orange, yellow, yellowgreen, green with blueviolet and violet.

Again we have twelve designs, with six colors against two mutual complementaries. It is not necessary now to call the attention to making additional designs with the grays or neutralized colors, as I believe that the student, at the present time, is well acquainted with the possibilities of making all the different gradations.

## QUESTIONNAIRE

1. How many spectrums do you use when you have six colors and two mutual complementaries?
2. Give an example of six colors and two mutual complementaries, one color of which is bluegreen.
3. Give an example of six colors and two mutual complementaries, one color of which is red.
4. Give an example of six colors and two mutual complementaries, one color of which is yellowgreen.
5. Give an example of six colors and two mutual complementaries, one color of which is purple.
6. Give an example of six colors and two mutual complementaries, one color of which is blue.

## THIRTY-THIRD LESSON

### Six Colors and Three Mutual Complementaries

This is the same as taking six spectrums and dividing the complementaries into three equal parts. Taking as an example, red, orange, yellow, yellowgreen, green, bluegreen, their complementaries would be blue, blueviolet, violet, purple, crimson, scarlet, and taking the total light of these complementaries and dividing them up into three spectral rays we would have a blueviolet-violet, a purple-violet, and a purple-crimson. This is the same theory which gave us the split complementary of one against two or four against three, as on the latter we have simply added two ends, the complementaries of which if mixed together could be divided up also into the three colors enumerated. You can see by this that all the splits are related. After completing the drawing of the designs on charts Nos. 68 and 69 you will color them as follows:

1. Red, orange, yellow, yellowgreen, green, bluegreen with blueviolet-violet, purple-violet, purple-crimson.
2. Orange, yellow, yellowgreen, green, bluegreen, blue with purple-violet, purple-crimson, scarlet-crimson.
3. Yellow, yellowgreen, green, bluegreen, blue, blueviolet with purple-crimson, scarlet-crimson, scarlet-red.
4. Yellowgreen, green, bluegreen, blue, blueviolet, violet with scarlet-crimson, scarlet-red, orange-red.
5. Green, bluegreen, blue, blueviolet, violet, purple with scarlet-red, orange-red, orange-yellow.
6. Bluegreen, blue, blueviolet, violet, purple, crimson with orange-red, orange-yellow, yellowgreen-yellow.
7. Blue, blueviolet, violet, purple, crimson, scarlet with orange-yellow, yellowgreen-yellow, yellowgreen-green.
8. Blueviolet, violet, purple, crimson, scarlet, red with yellowgreen-yellow, yellowgreen-green, bluegreen-green.
9. Violet, purple, crimson, scarlet, red, orange with yellowgreen-green, bluegreen-green, bluegreen-blue.
10. Purple, crimson, scarlet, red, orange, yellow with bluegreen-green, bluegreen-blue, blueviolet-blue.
11. Crimson, scarlet, red, orange, yellow, yellowgreen with bluegreen-blue, blueviolet-blue, blueviolet-violet.
12. Scarlet, red, orange, yellow, yellowgreen, green with blueviolet-blue, blueviolet-violet, purple-violet.

## QUESTIONNAIRE

1. How many spectrums do you use when you have six colors and three mutual complementaries?

2. Give an example of six colors and three mutual complementaries, one color of which is purple-violet.

3. Give an example of six colors and three mutual complementaries, one color of which is yellow.

4. Give an example of six colors and three mutual complementaries, one color of which is scarlet-red.

5. Give an example of six colors and three mutual complementaries, one color of which is blueviolet.

6. Give an example of six colors and three mutual complementaries, one color of which is green.

## THIRTY-FOURTH LESSON

### Six Colors and Four Mutual Complementaries

This is the same as taking six spectrum charts; and again taking all the complementaries together. Instead of having six regular complementaries you divide the total amount of the color light into four rays of light. Take as an example red, orange, yellow, yellowgreen, green, blue-green—we find the four colors that would be mutually complementary are blueviolet, violet, purple, and crimson. This is the same as we did in the split color combination of three against one, only adding more colors on each end, as the end complementary light when mixed together would make the same as the center.

After completing the drawing of the designs on charts No. 70 and 71 you will color them as follows:

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1. Red, orange, yellow, yellowgreen, green, bluegreen with blueviolet, violet, purple, crimson.
2. Orange, yellow, yellowgreen, green, bluegreen, blue with violet, purple, crimson, scarlet.
3. Yellow, yellowgreen, green, bluegreen, blue, blueviolet with purple, crimson, scarlet, red.
4. Yellowgreen, green, bluegreen, blue, blueviolet, violet with crimson, scarlet, red, orange.
5. Green, bluegreen, blue, blueviolet, violet, purple with scarlet, red, orange, yellow.
6. Bluegreen, blue, blueviolet, violet, purple, crimson with red, orange, yellow, yellowgreen.
7. Blue, blueviolet, violet, purple, crimson, scarlet with orange, yellow, yellowgreen, green.
8. Blueviolet, violet, purple, crimson, scarlet, red with yellow, yellowgreen, green, bluegreen.
9. Violet, purple, crimson, scarlet, red, orange with yellowgreen, green, bluegreen, blue.
10. Purple, crimson, scarlet, red, orange, yellow with green, bluegreen, blue, blueviolet.
11. Crimson, scarlet, red, orange, yellow, yellowgreen with bluegreen, blue, blueviolet, violet.
12. Scarlet, red, orange, yellow, yellowgreen, green with blue, blueviolet, violet, purple.

Again you see we have twelve designs, and again reminding you of doing all these extra charts in the neutralized tones and tints.

## QUESTIONNAIRE

1. How many spectrums do you use when you have six colors and four mutual complementaries?
2. Give an example of six colors and four mutual complementaries, one color of which is bluegreen.
3. Give an example of six colors and four mutual complementaries, one color of which is yellow.

4. Give an example of six colors and four mutual complementaries, one color of which is red.

5. Give an example of six colors and four mutual complementaries, one color of which is orange.

6. Give an example of six colors and four mutual complementaries, one color of which is blueviolet.

## THIRTY-FIFTH LESSON

### Six Colors and Five Mutual Complementaries

This is the same as if we took again the six spectrums, and dividing up the complementaries into five equal parts instead of as in the regular complementaries of six colors. Taking as an example red, orange, yellow, yellowgreen, green, bluegreen, the regular complementaries of which would be blue, blueviolet, violet, purple, crimson, scarlet, we throw these rays together and divide them again into five parts, which would give us the colors of the 24-color spectrum, namely, blueviolet-blue, blueviolet-violet, purple-violet, purple-crimson, and scarlet-crimson. This is in the same classification as the two colors against one, only multiplied five times.

After completing the drawing of the designs on charts No. 72 and 73 you will color them as follows:

1. Red, orange, yellow, yellowgreen, green, bluegreen with blueviolet-blue, blueviolet-violet, purple-violet, purple-crimson, scarlet-crimson.

2. Orange, yellow, yellowgreen, green, bluegreen, blue with blueviolet-violet, purple-violet, purple-crimson, scarlet-crimson, scarlet-red.

3. Yellow, yellowgreen, green, bluegreen, blue, blueviolet with purple-violet, purple-crimson, scarlet-crimson, scarlet-red, orange-red.

4. Yellowgreen, green, bluegreen, blue, blueviolet, violet with purple-crimson, scarlet-crimson, scarlet-red, orange-red, orange-yellow.

5. Green, bluegreen, blue, blueviolet, violet, purple with scarlet-crimson, scarlet-red, orange-red, orange-yellow, yellow-green-yellow.

6. Bluegreen, blue, blueviolet, violet, purple, crimson with scarlet-red, orange-red, orange-yellow, yellowgreen-yellow, yellowgreen-green.

7. Blue, blueviolet, violet, purple, crimson, scarlet with orange-red, orange-yellow, yellowgreen-yellow, yellowgreen-green, bluegreen-green.

8. Blueviolet, violet, purple, crimson, scarlet, red with orange-yellow, yellowgreen-yellow, yellowgreen-green, bluegreen-green, bluegreen-blue.

9. Violet, purple, crimson, scarlet, red, orange with yellow-green-yellow, yellowgreen-green, bluegreen-green, bluegreen-blue, blueviolet-blue.

10. Purple, crimson, scarlet, red, orange, yellow with yellow-green-green, bluegreen-green, bluegreen-blue, blueviolet-blue, blue-violet-violet.

11. Crimson, scarlet, red, orange, yellow, yellowgreen with bluegreen-green, bluegreen-blue, blueviolet-blue, blueviolet-violet, purple-violet.

12. Scarlet, red, orange, yellow, yellowgreen, green with blue-green-blue, blueviolet-blue, blueviolet-violet, purple-violet, purple-crimson.

And again, for the last time, we have twelve color combinations, based on the six colors with five mutual complementaries. The student should try out many of these color combinations as before in the neutralized tones and tints.

We have now done the split or mutual color complementaries which balance from the center. Other color combinations based on the mutual or split complementaries can be arranged with the balance on the two ends, and not in the center. For example, you could take either the fours, fives, or sixes, and balance with two, three, four, or five—if you took the red, orange, yellow, yellowgreen, green, bluegreen you could have the regular complementaries divided up so that the mutual complementaries would be blueviolet-blue, blueviolet-violet, purple-crimson, and scarlet-crimson. This would give you only four mutual complementaries against six, but you will see that if this was five colors against six instead of four colors you would have left out only the mutual complementary which would have been purple-violet, but this also would balance and make what we know as a syncopation or skipping of color. Another example would be to take four colors—red, orange, yellow, yellowgreen with blue and purple as the mutual complementaries, and here again it is the same as the regular complementaries, but you have left out the two center colors in the regular, five and five complementaries, which would have been blueviolet and violet, in other words, starting the color combinations from the ends rather than from the center. In this syncopation you would have to make only two complementaries very much more brilliant than you would in the regular complementary combination.

## QUESTIONNAIRE

1. How many spectrums do you use when you have six colors and five mutual complementaries?
2. Give an example of six colors and five mutual complementaries, one color of which is purple-crimson.
3. Give an example of six colors and five mutual complementaries, one color of which is orange.
4. Give an example of six colors and five mutual complementaries, one color of which is yellowgreen.
5. Give an example of six colors and five mutual complementaries, one color of which is orange-red.
6. Give an example of six colors and five mutual complementaries, one color of which is blue.

## THIRTY-SIXTH LESSON

### Triads

By using the Spectrum Chart on Plate I in this method you will be able to explain the color theories of all scientists. The three primary colors which they take as a standard are very easy to understand, some taking one triad as the three primaries, others taking another set of three colors. In this book I have chosen to select the one that was discovered by Helmholtz, of red, green, and violet, but it would make no difference in regard to the color combinations which system we used, provided the spectrum was divided up into three equal parts in the exact colors or hues enumerated, as the complementaries would always be the same and the combinations likewise.

Care must be taken, however, in seeing that the exact hue is selected. For example, in mentioning blue it must not be a blueviolet, or a green must not be a bluegreen. The spectrum must always be divided up in exact thirds. This will explain many of the conflicting theories that have been published heretofore. So many scientists use different names for colors, whereas if we have the standard name, as we have used in this book, there should never be a conflict providing the theory is based on the laws of nature.

You will color chart No. 74 in the following colors:

1. Red, green, and violet.
2. Orange, bluegreen, and purple.
3. Yellow, blue, and crimson.
4. Yellowgreen, blueviolet, and scarlet.

The other two designs on this page you will color in the neutralized colors of any one of these triads.

## QUESTIONNAIRE

1. What is meant by a triad?
2. What was the color of the spectrum discovered by Helmholtz?
3. What is the difference between the Helmholtz spectrum and the Newton spectrum?
4. How do we know which is the blue of the spectrum?
5. How do we know which is the crimson of the spectrum?
6. How do we know which is the yellow of the spectrum?
7. Give an example of a triad, one color of which is red.
8. Give an example of a triad, one color of which is yellow.
9. Give an example of a triad, one color of which is yellowgreen.
10. Can I name any other triad in the 12-color spectrum?

## THIRTY-SEVENTH LESSON

### Monochromes

The last exercise is a very simple one and is based on the idea of training the eye to paint in one color only, in all its shades and tints. It is necessary to make one chart for each color. You have therefore been supplied blank charts, enough for all twelve colors, Nos. 75 to 86. Color one chart in red, the next in orange, etc., as follows:

1st Design. 0A, 1A, 2A, 3A.
2d Design. 0B, 1B, 2B, 3B.
3d Design. 0C, 1C, 2C, 3C.
4th Design. 0D, 1D, 2D, 3D.
5th Design. 0A, 1B, 2C, 3D.
6th Design. 0D, 1C, 2B, 3A.

These colors will all be red, with the different shades and tints, without showing the complementary itself.

You will now make another chart using only orange in the same way, as was said, and another one with yellow, another with yellowgreen, another with green, another with bluegreen, another with blue, another with blueviolet, another with violet, another with purple, another with crimson, and another with scarlet. This will make twelve charts all in monochrome, and you can select any means of composition, either with the figure, landscape, or conventional design.

This ends the color exercises for composition of color.

## QUESTIONNAIRE

1. What is meant by a monochrome?
2. Give an example of a monochrome in red, using the numbers and letters in color-mixing chart.
3. Give another example using only the tints of the brilliant color.
4. Give another example using only the neutralized colors in the 3d neutralization.

## THIRTY-EIGHTH LESSON

### STILL LIFE PAINTING

### THE PAINTING AND THE STUDY OF SHADOWS

THE SHADOW OF AN OBJECT GOES TOWARD ITS COMPLEMENTARY, how far toward its complementary depends on how brilliant the object is or how much light is on the object. All colors that are orange, red, scarlet, crimson, purple, and violet go counter-clockwise to their complementary. All colors that are yellow, yellowgreen, green, bluegreen, blue, and blueviolet go clockwise to their complementary on the spectrum chart.

The more light that is on an object the further around toward its complementary color will the shadow go, i.e., if an orange vase is painted indoors, the shadow of the orange vase will go *toward* its complementary counter-clockwise on the spectrum chart. This would bring the color of the shadow to about crimson or scarlet; now as the shadow is down in brilliancy, this crimson or scarlet would be neutralized as in your color charts with their respective complementaries, i.e., the lighted side of the vase would be orange oA, and the shadow indoors would be A2 or B2, depending how much light and how much reflected light is on the object. If the same vase was placed outdoors under a clouded sky the shadow would go further toward the complementary and would be about the color of purple, grayed, of course, with its complementary. If the same object was placed in the sunlight and the lighted side was still orange the shadow would be a grayed violet. All of these shadows would be modified by the reflected lights in them, such as the light of the ceiling, the light of the sky, or the reflected light of the ground, etc.

You will notice that the highlight on a shiny surface will not be white or a direct reflection of the light, but will be mixed with a color which is either its complementary or a color toward its complementary, depending on how shiny the surface is. If the object has a highly glazed surface, as a perfect mirror, you will notice that while it reflects a window or other light it will be tinted with the direct complementary of the lighted side. If this surface, however, is not so shiny this light will go toward the complementary the reverse way to the way the shadow goes, and if it has a dull surface it will not go even as far as a semi-glazed surface.

Metallic surfaces go both ways to their complementary simultaneously—this accounts for the iridescent quality of copper, brass, and other metals. It has been found that this is the reason for the metallic surface in contradiction to the pigmentary surface.

If you wish to contiue the study of color for the use of landscape painting or portrait painting and all the applied arts, you can find much more of this phenomena of nature in "The Art of Color."

## QUESTIONNAIRE

1. Is the color of a shadow the same color as the lighted side?
2. How do we determine the color of a shadow?
3. Which way does the shadow of an orange object go in the spectrum chart?
4. Which way does the shadow of a red object go in the spectrum chart?
5. Which way does the shadow of a scarlet object go in the spectrum chart?
6. Which way does the shadow of a crimson object go in the spectrum chart?
7. Which way does the shadow of a purple object go in the spectrum chart?
8. Which way does the shadow of a violet object go in the spectrum chart?
9. Which way does the shadow of a yellow object go in the spectrum chart?
10. Which way does the shadow of a yellowgreen object go in the spectrum chart?
11. Which way does the shadow of a green object go in the spectrum chart?
12. Which way does the shadow of a bluegreen object go in the spectrum chart?
13. Which way does the shadow of a blue object go in the spectrum chart?
14. Which way does the shadow of a blueviolet object go in the spectrum chart?

15. What happens to the shadow when an object has a lot of light reflected from it?

16. Does the same thing happen if the color is brilliant as when it is dull?

17. Does an object placed outdoors in the brilliant sun have the same color shadow as when indoors, and what is the difference?

18. What color is the highlight of an object if it has a glazed surface?

19. What happens to metallic surfaces?

20. What is the difference between a metallic surface and a pigmentary surface?

## GLOSSARY

1. **Light.**—A vibration which makes us see, or chemicals to act. Without light all colors are black.
2. **Spectrum.**—A beam of light divided into its component color rays.
3. **Color.**—The power of any substance to reflect one or more rays of the spectrum. Dye, pigments, flowers and leaves, earth, metal, in fact everything in nature can reflect some color rays of the spectrum.
4. **White.**—Any substance which has the power to reflect all of the rays of the spectrum equally well.
5. **Black.**—Any substance which cannot reflect any of the rays of the spectrum. In theory this is so, but practically all substances, even black velvet, which is the least reflective, reflects some light, and therefore color. Only where there is an absence of light is there black, and then all colors are black, including white.
6. **Pigment.**—A chemical or any substance which has the power to reflect one or more of the rays of the spectrum.
7. **Complementaries.**—Two colors which when combined complete a spectrum. To find out if a color is complementary mix the two colors together and if they form a perfectly neutral gray they are complementary, or throw two lights together and if they make a white light they are complementary.
8. **Split Complementaries.**—A set of colors which have their complementaries joined in less numbers than the regular complementaries, which when mixed together would make a neutral gray and uses two or more spectrums.
9. **Harmonies.**—Any set of colors within half a spectrum, not

more than six and not less than three in the 12-color spectrum, or not more than twelve or not less than three in the 24-color spectrum.

10. NEUTRALIZED COLORS.—A pigment or other substance which cannot reflect any ray of the spectrum *perfectly,* and is made by mixing its complementary in more or less quantity.

11. SHADE OR TONE.—A color which is neutralized.

12. TINT.—Any color which is lighter than the intense color of the spectrum, either by adding white or diluting; not full saturation. The power of any substance to reflect more or less perfectly all colors of the spectrum, but one color in particular a little better than the other rays.

13. NEUTRAL.—A pigment or dye or other substance which reflects all colors of the spectrum imperfectly, not one in particular. A diluted black wash on top of white paper would make a neutral if the black was a non-reflective color. Gray.

14. BRILLIANT COLOR.—A color which has the power to reflect perfectly one or more rays of the spectrum. This is only relative as there is no pigment made that reflects perfectly the rays of the spectrum.

15. ONE COLOR AND ONE COMPLEMENTARY.—A combination of colors using one complete spectrum, which if mixed together would make a neutral, whether in brilliants or neutralized tones or tints.

16. TWO COLORS AND TWO COMPLEMENTARIES.—A combination of colors using two spectrums, which if mixed together would make a neutral, whether in brilliants or neutralized tones or tints.

17. THREE COLORS AND THREE COMPLEMENTARIES.—A combination of colors using three spectrums, which if mixed together would make a neutral, whether in brilliants or neutralized tones or tints.

18. FOUR COLORS AND FOUR COMPLEMENTARIES.—A combination of colors using four spectrums, which if mixed together would make a neutral, whether in brilliants or neutralized tones or tints.

19. FIVE COLORS AND FIVE COMPLEMENTARIES.—A combina-

tion of colors using five spectrums, which if mixed together would make a neutral, whether in brilliants or neutralized tones or tints.

20. Three Colors in Analogous Harmony.—Three colors in the spectrum which are adjacent to each other, whether in brilliants or in neutralized tones or tints.

21. Four Colors in Analogous Harmony.—Four colors in the spectrum which are adjacent to each other, whether in brilliants or in neutralized tones or tints.

22. Five Colors in Analogous Harmony.—Five colors in the spectrum which are adjacent to each other, whether in brilliants or in neutralized tones or tints.

23. Six Colors in Analogous Harmony.—Six colors in the spectrum which are adjacent to each other, whether in brilliants or in neutralized tones or tints.

24. Two Colors and One Mutual Complementary.—A combination of colors which uses two spectrum bands, the complementaries of which are combined into one ray, which if mixed together would make a perfect neutral gray.

25. Three Colors and One Mutual Complementary.—A combination of colors which uses three spectrum bands, the complementaries of which are combined into one ray, which if mixed together would make a perfect neutral gray.

26. Three Colors and Two Mutual Complementaries.—A combination of colors which uses three spectrum bands, the complementaries of which are combined into two rays, which if mixed together would make a perfect neutral gray.

27. Four Colors and One Mutual Complementary.—A combination of colors which uses four spectrum bands, the complementaries of which are combined into one ray, which if mixed together would make a perfect neutral gray.

28. Four Colors and Two Mutual Complementaries.—A combination of colors which uses four spectrum bands, the complementaries of which are combined into two rays,

which if mixed together would make a perfect neutral gray.

29. Four Colors and Three Mutual Complementaries.—A combination of colors which uses four spectrum bands, the complementaries of which are combined into three rays, which if mixed together would make a perfect neutral gray.

30. Five Colors and One Mutual Complementary.—A combination of colors which uses five spectrum bands, the complementaries of which are combined into one ray, which if mixed together would make a perfect neutral gray.

31. Five Colors and Two Mutual Complementaries.—A combination of colors which uses five spectrum bands, the complementaries of which are combined into two rays, which if mixed together would make a perfect neutral gray.

32. Five Colors and Three Mutual Complementaries.—A combination of colors which uses five spectrum bands, the complementaries of which are combined into three rays, which if mixed together would make a perfect neutral gray.

33. Five Colors and Four Mutual Complementaries.—A combination of colors which uses five spectrum bands, the complementaries of which are combined into four rays, which if mixed together would make a perfect neutral gray.

34. Six Colors and One Mutual Complementary.—A combination of colors which uses six spectrum bands, the complementaries of which are combined into one ray, which if mixed together would make a perfect neutral gray.

35. Six Colors and Two Mutual Complementaries.—A combination of colors which uses six spectrum bands, the complementaries of which are combined into two rays, which if mixed together would make a perfect neutral gray.

36. Six Colors and Three Mutual Complementaries.—A combination of colors which uses six spectrum bands,

the complementaries of which are combined into three rays, which if mixed together would make a perfect neutral gray.

37. SIX COLORS AND FOUR MUTUAL COMPLEMENTARIES.—A combination of colors which uses six spectrum bands, the complementaries of which are combined into four rays, which if mixed together would make a perfect neutral gray.

38. SIX COLORS AND FIVE MUTUAL COMPLEMENTARIES.—A combination of colors which uses six spectrum bands, the complementaries of which are combined into five rays, which if mixed together would make a perfect neutral gray.

39. TRIADS. A combination of colors which divides the spectrum into three equal parts, which if mixed together would form a perfect neutral gray.

40. MONOCHROMES.—One color which is either brilliant, neutralized with its complementary or in any tint of the brilliant or neutralized tone. The same color shown in more or less intense light or shadow.

41. SHADOWS.—The shadow of an object always goes *toward* the complementary, depending how much light is on the object or how brilliant the object is.

42. HIGHLIGHT.—The highlight of an object is always tinted with its complementary if the subject has a glazed surface or a color toward its complementary; if the object has a semi-glazed or dull surface, the opposite way in which the shadow goes on the spectrum circle.

# CHARTS

## JACOBS SPECTRUM CHART

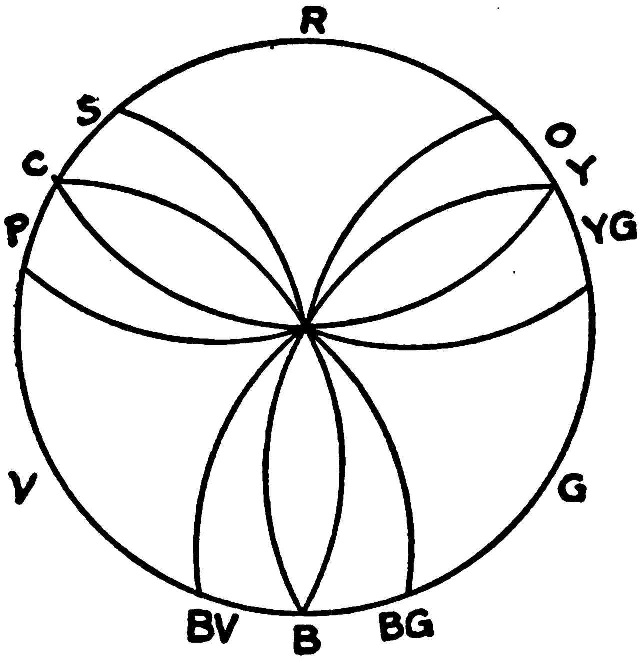

CHART 1

### THE SPECTRUM PRIMARIES

are Red, Green and Violet

### THE PIGMENTARY PRIMARIES

are— Crimson
Yellow and
Blue

These are also the Secondaries of the Spectrum

### COMPLEMENTARIES

| | |
|---|---|
| Red | Blue |
| Orange | Blueviolet |
| Yellow | Violet |
| Yellowgreen | Purple |
| Green | Crimson |
| Bluegreen | Scarlet |

Original from UNIVERSITY OF MICHIGAN

## JACOBS COLOR MIXING CHART

| | 0 BRILLIANT | 1 | 2 | 3 | 4 NEUTRAL | 3 | 2 | 1 | 0 BRILLIANT | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | | | | | | | | | | A |
| B | | | | | | | | | | B |
| C | | | | | | | | | | C |
| D | | | | | | | | | | D |

CHART 2

To Be Colored in All the Shades and Tints of Red and Blue

## JACOBS COLOR MIXING CHART

|  | 0<br>BRILLIANT | 1 | 2 | 3 | 4<br>NEUTRAL | 3 | 2 | 1 | 0<br>BRILLIANT |  |
|---|---|---|---|---|---|---|---|---|---|---|
| A |  |  |  |  |  |  |  |  |  | A |
| B |  |  |  |  |  |  |  |  |  | B |
| C |  |  |  |  |  |  |  |  |  | C |
| D |  |  |  |  |  |  |  |  |  | D |

CHART 3

To Be Colored in All the Shades and Tints of Orange and Blueviolet

## JACOBS COLOR MIXING CHART

| | 0<br>BRILLIANT | 1 | 2 | 3 | 4<br>NEUTRAL | 3 | 2 | 1 | 0<br>BRILLIANT | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | | | | | | | | | | A |
| B | | | | | | | | | | B |
| C | | | | | | | | | | C |
| D | | | | | | | | | | D |

**CHART 4**

To Be Colored in All the Shades and Tints of Yellow and Violet

## JACOBS COLOR MIXING CHART

| | 0 BRILLIANT | 1 | 2 | 3 | 4 NEUTRAL | 3 | 2 | 1 | 0 BRILLIANT | |
|---|---|---|---|---|---|---|---|---|---|---|
| **A** | | | | | | | | | | **A** |
| **B** | | | | | | | | | | **B** |
| **C** | | | | | | | | | | **C** |
| **D** | | | | | | | | | | **D** |

**CHART 5**

To Be Colored in All the Shades and Tints of Yellowgreen and Purple

Original from UNIVERSITY OF MICHIGAN

## JACOBS COLOR MIXING CHART

| | 0 BRILLIANT | 1 | 2 | 3 | 4 NEUTRAL | 3 | 2 | 1 | 0 BRILLIANT | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | | | | | | | | | | A |
| B | | | | | | | | | | B |
| C | | | | | | | | | | C |
| D | | | | | | | | | | D |

CHART 6

To Be Colored in All the Shades and Tints of Green and Crimson

Original from UNIVERSITY OF MICHIGAN

## JACOBS COLOR MIXING CHART

|  | 0<br>BRILLIANT | 1 | 2 | 3 | 4<br>NEUTRAL | 3 | 2 | 1 | 0<br>BRILLIANT |  |
|---|---|---|---|---|---|---|---|---|---|---|
| A |  |  |  |  |  |  |  |  |  | A |
| B |  |  |  |  |  |  |  |  |  | B |
| C |  |  |  |  |  |  |  |  |  | C |
| D |  |  |  |  |  |  |  |  |  | D |

CHART 7

To Be Colored in All the Shades and Tints of Bluegreen and Scarlet

Original from UNIVERSITY OF MICHIGAN

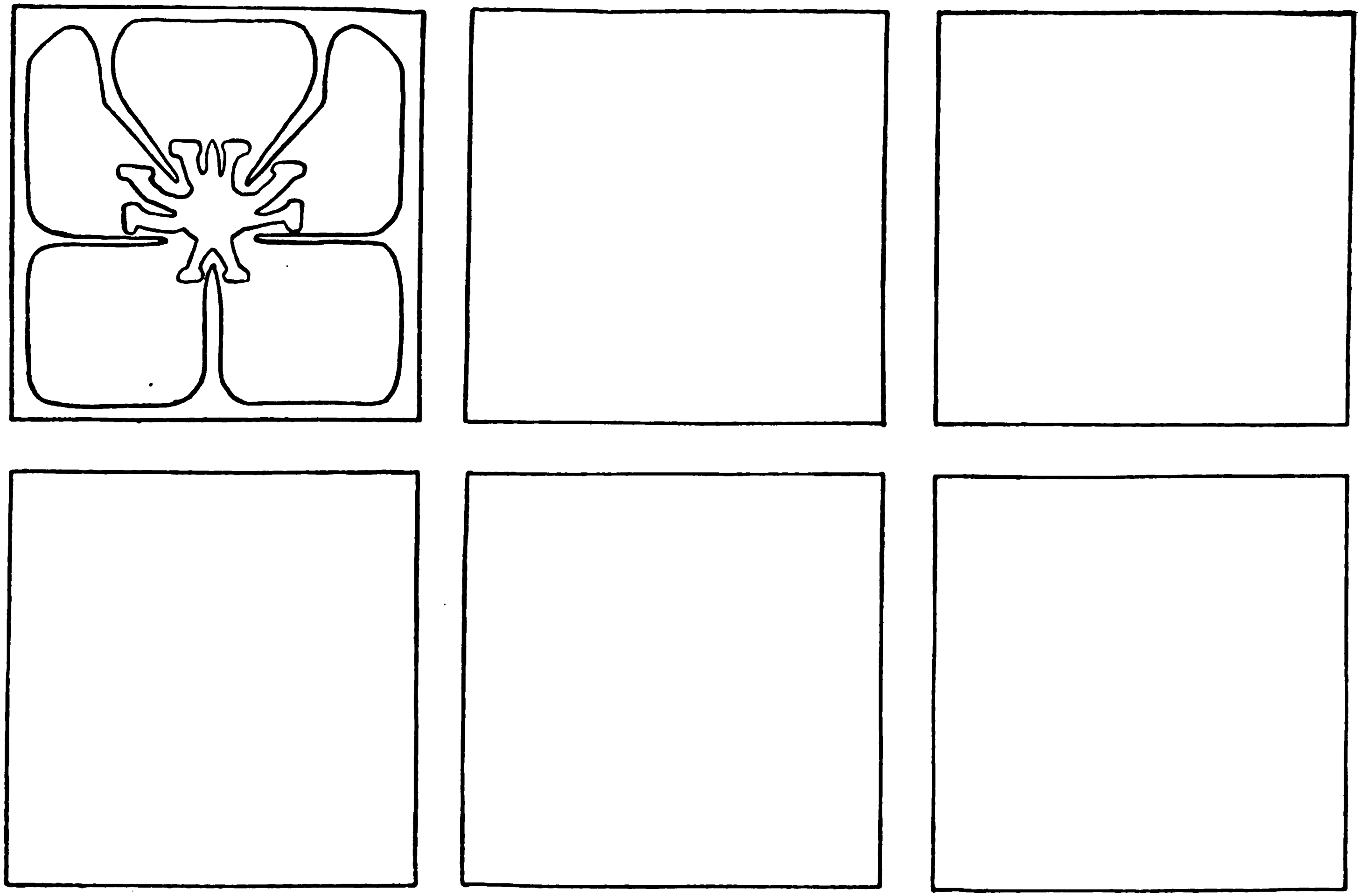

CHART 8

To Be Colored in One Color and One Complementary in Brilliants

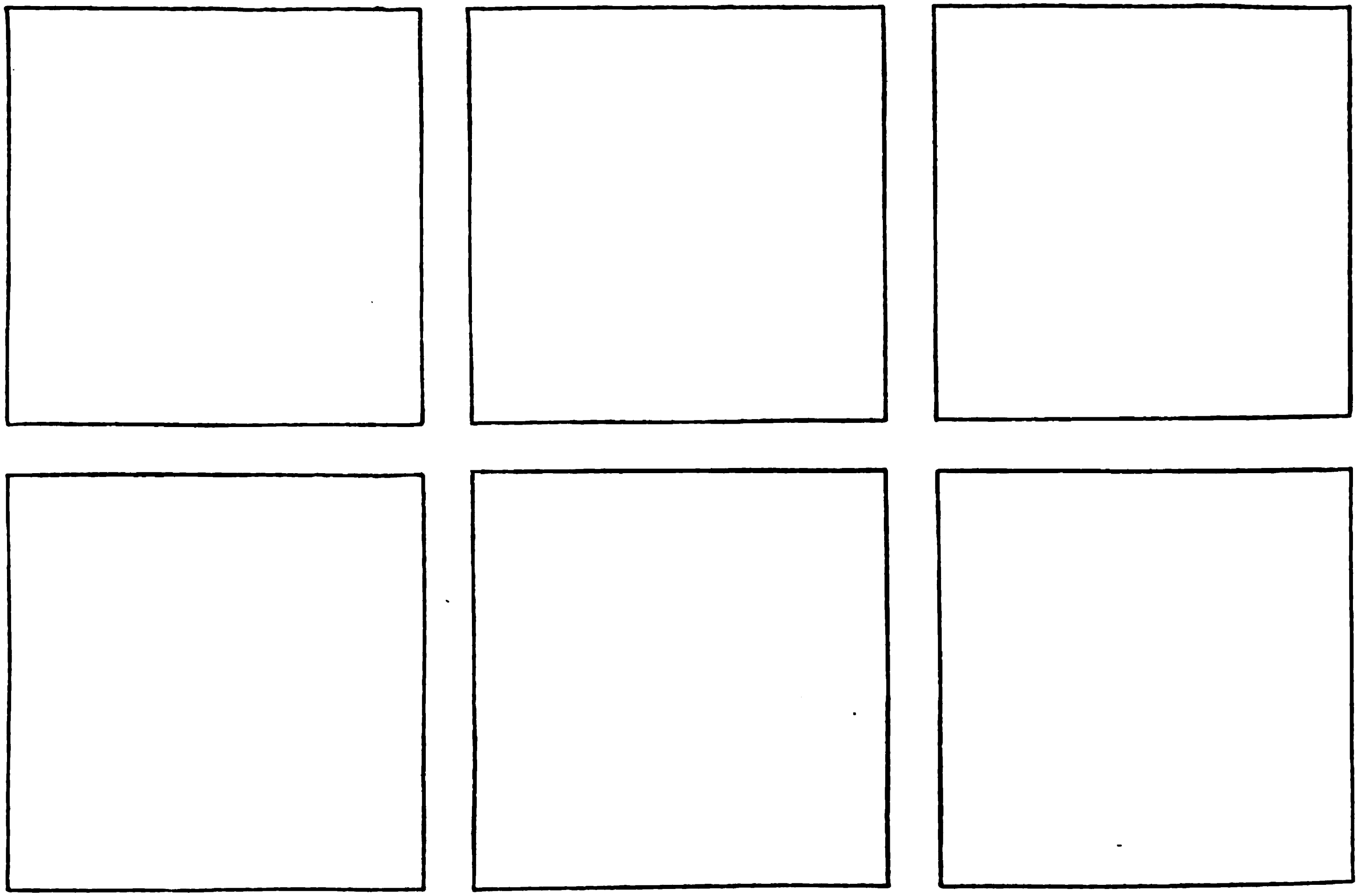

CHART 9

TO BE COLORED IN ONE COLOR AND ONE COMPLEMENTARY IN BRILLIANTS

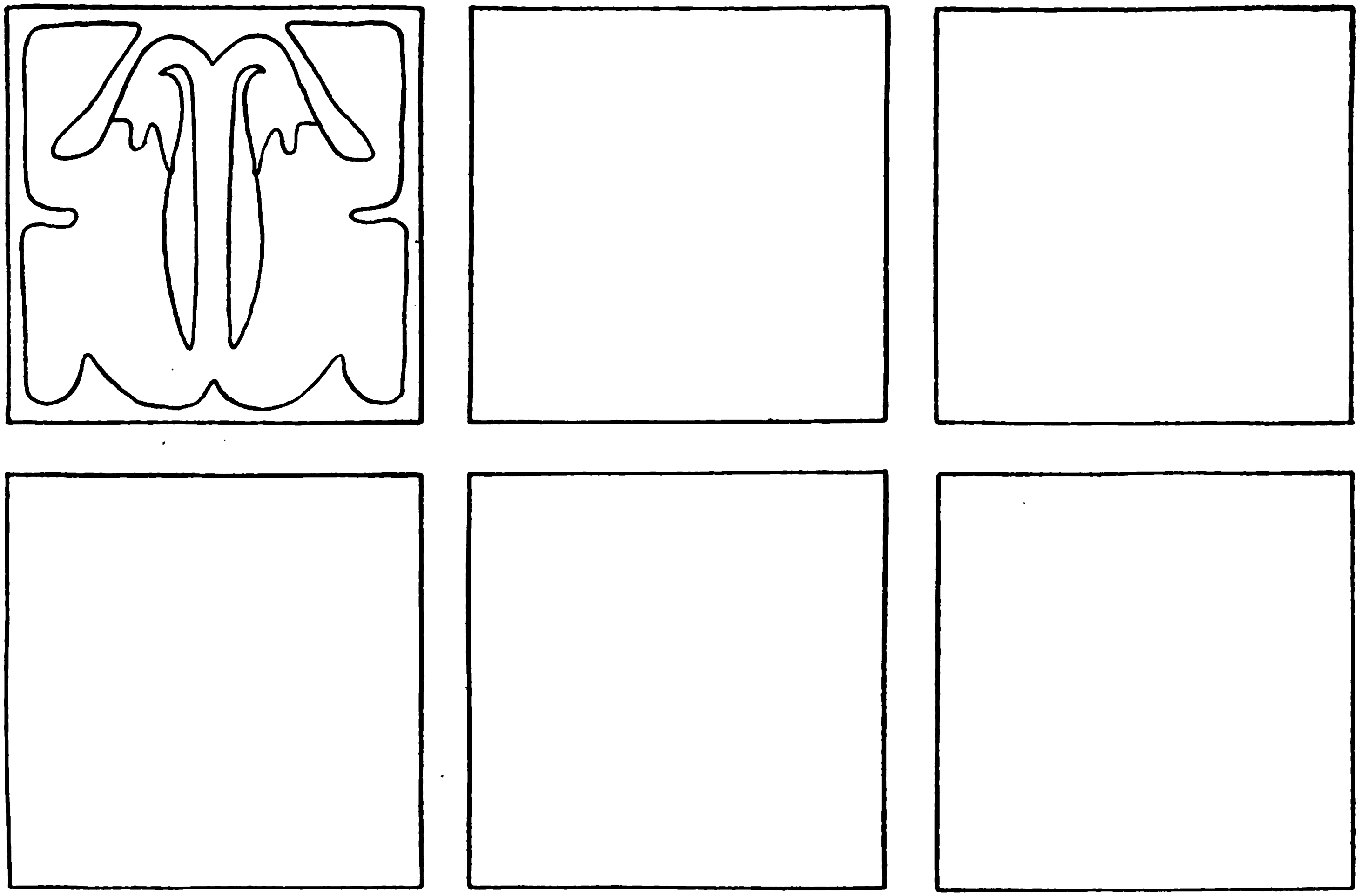

CHART 10

To Be Colored in Two Colors and Two Complementaries in Brilliants

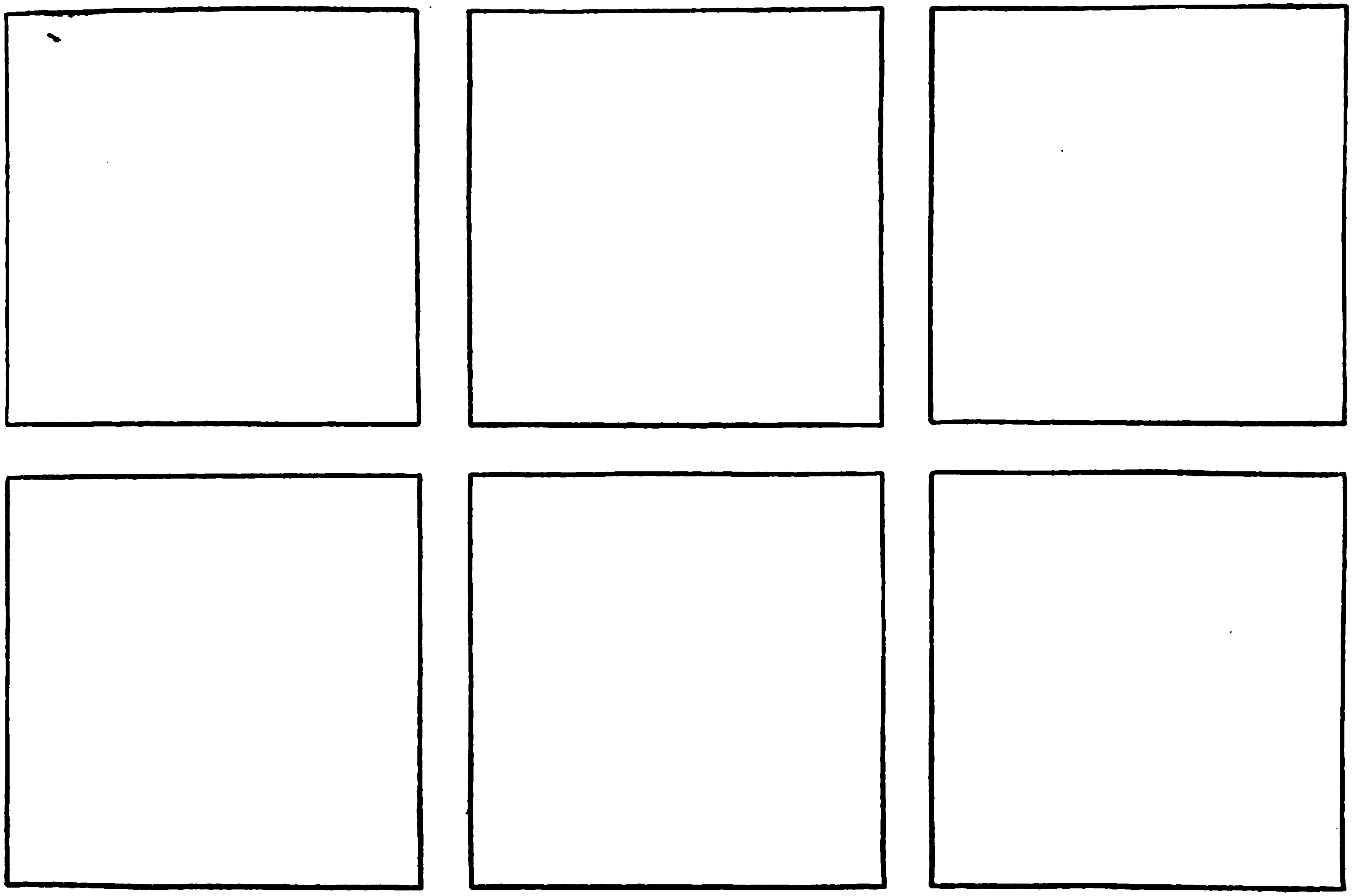

CHART 11

TO BE COLORED IN TWO COLORS AND TWO COMPLEMENTARIES IN BRILLIANTS

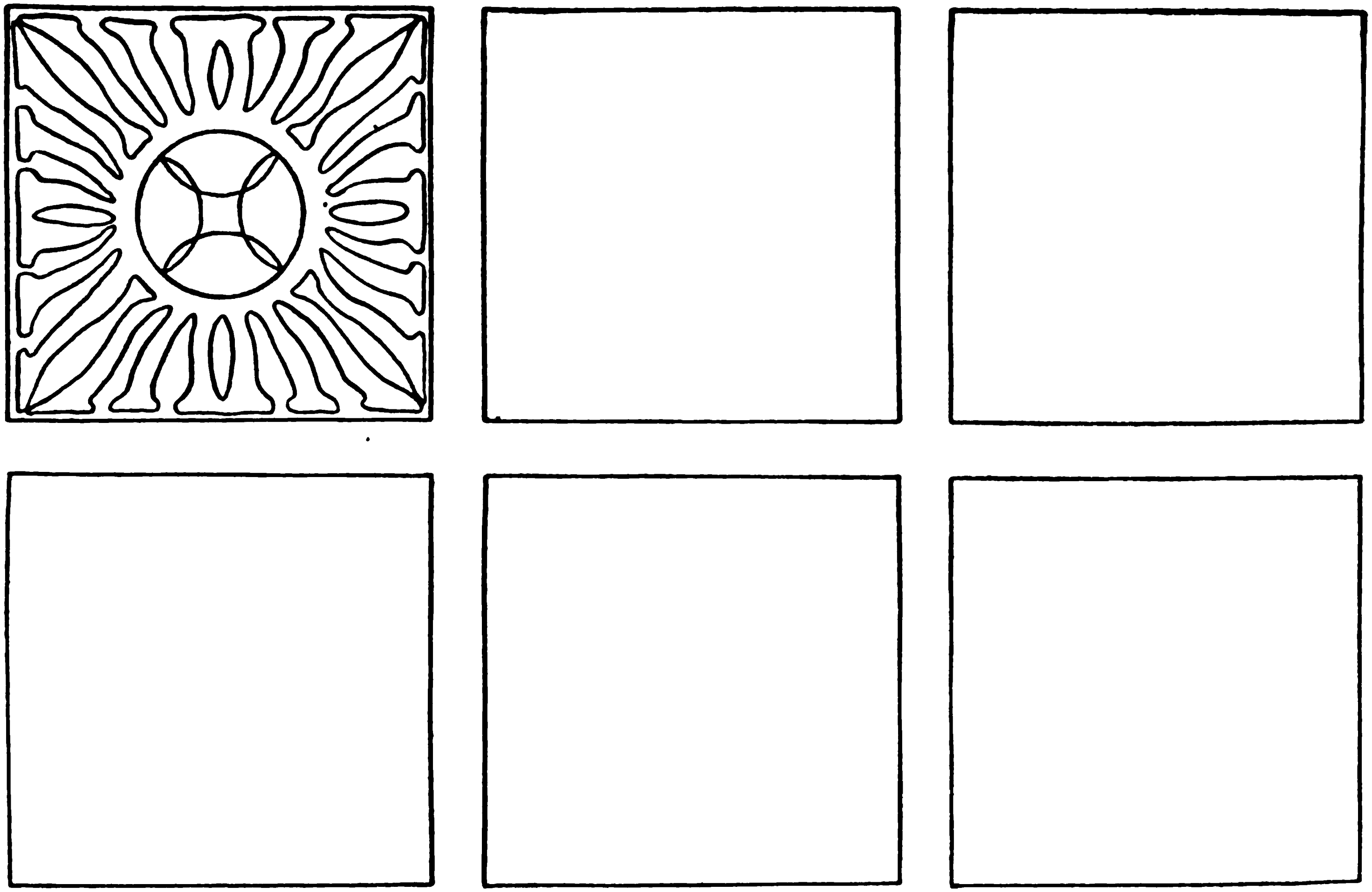

CHART 12

To Be Colored in Three Colors and Three Complementaries in Brilliants

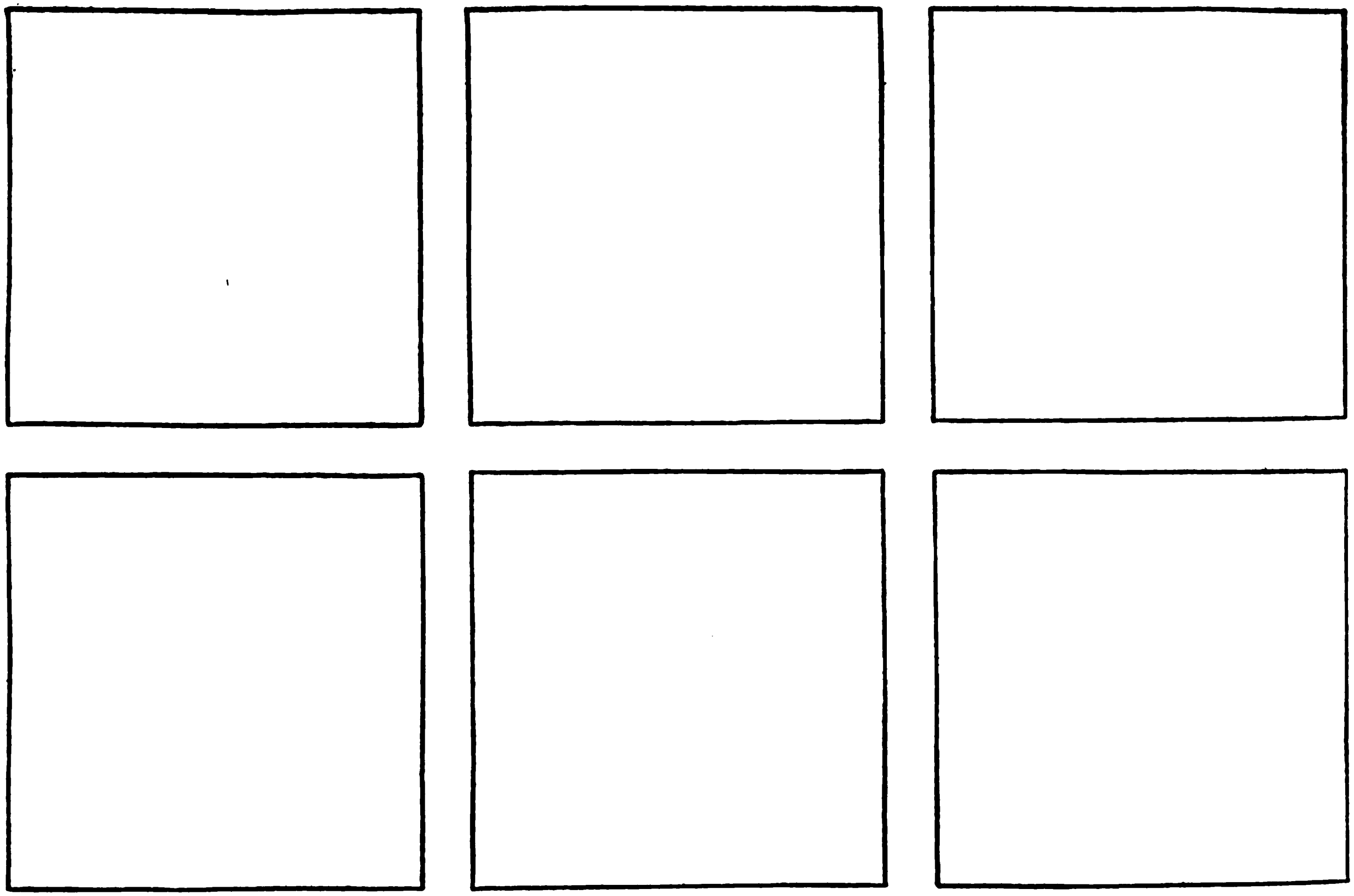

CHART 13

To Be Colored in Three Colors and Three Complementaries in Brilliants

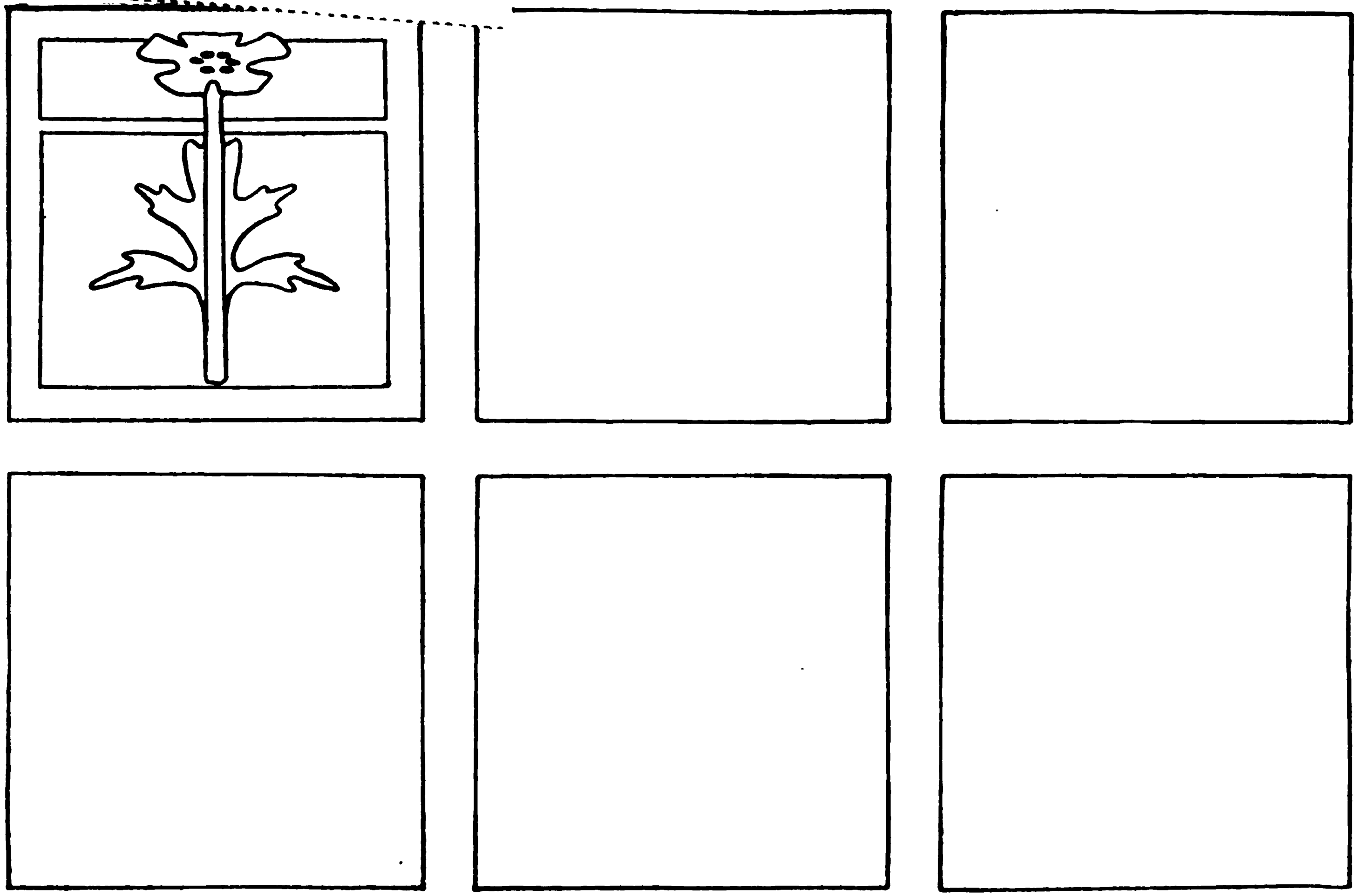

CHART 14

To Be Colored in Four Colors and Four Complementaries in Brilliants

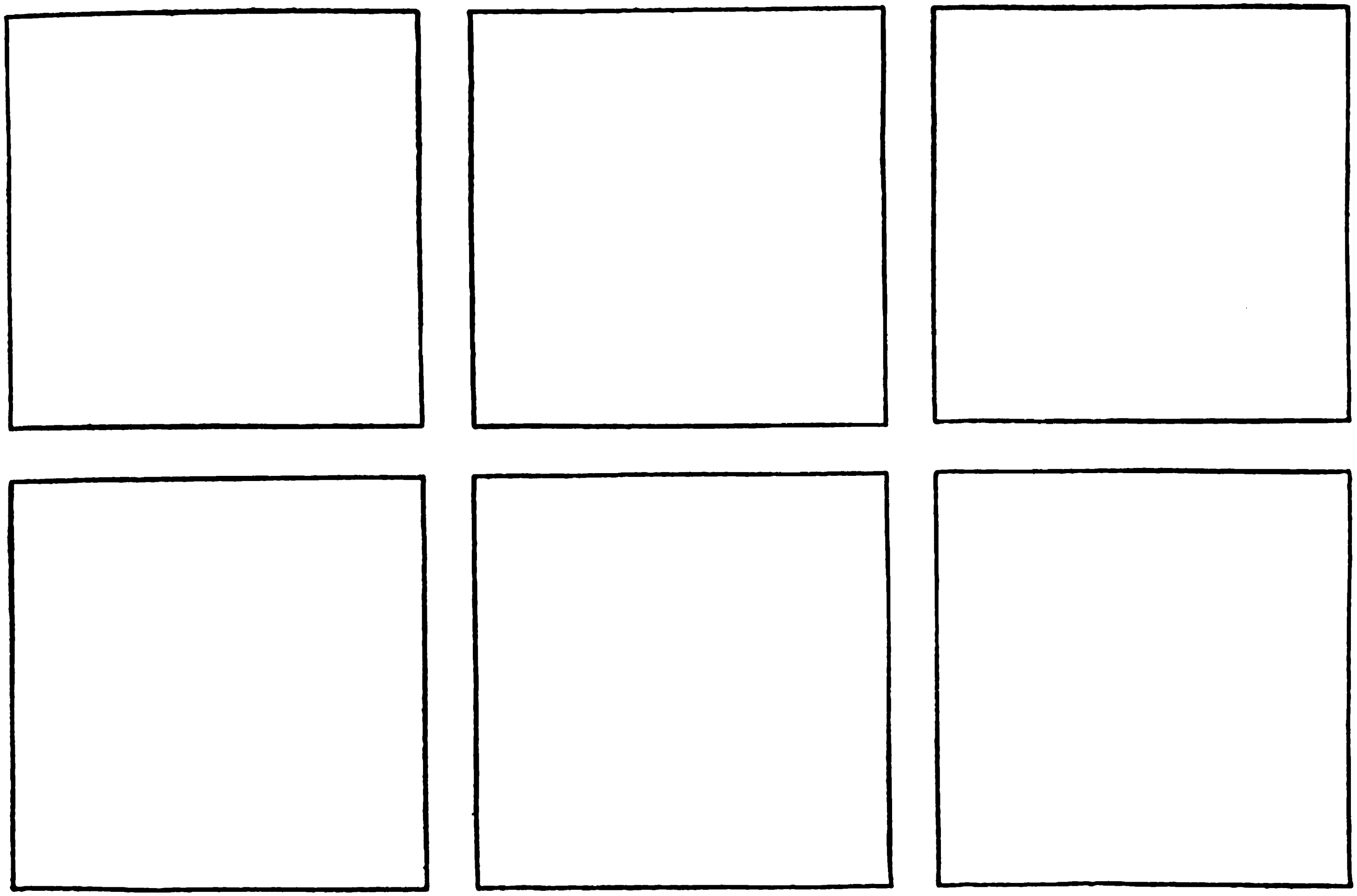

CHART 15

To Be Colored in Four Colors and Four Complementaries in Brilliants

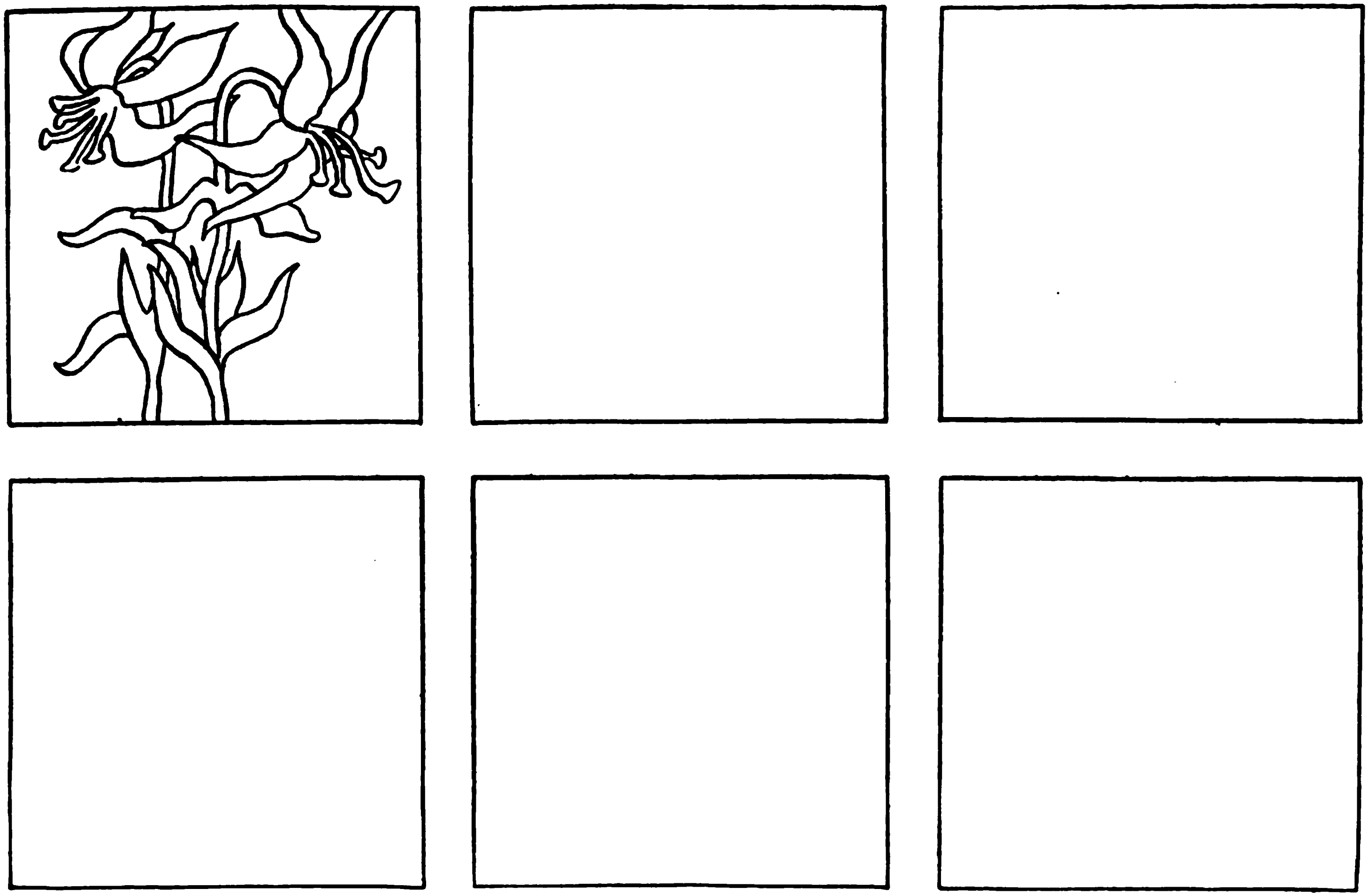

CHART 16

To Be Colored in Five Colors and Five Complementaries in Brilliants

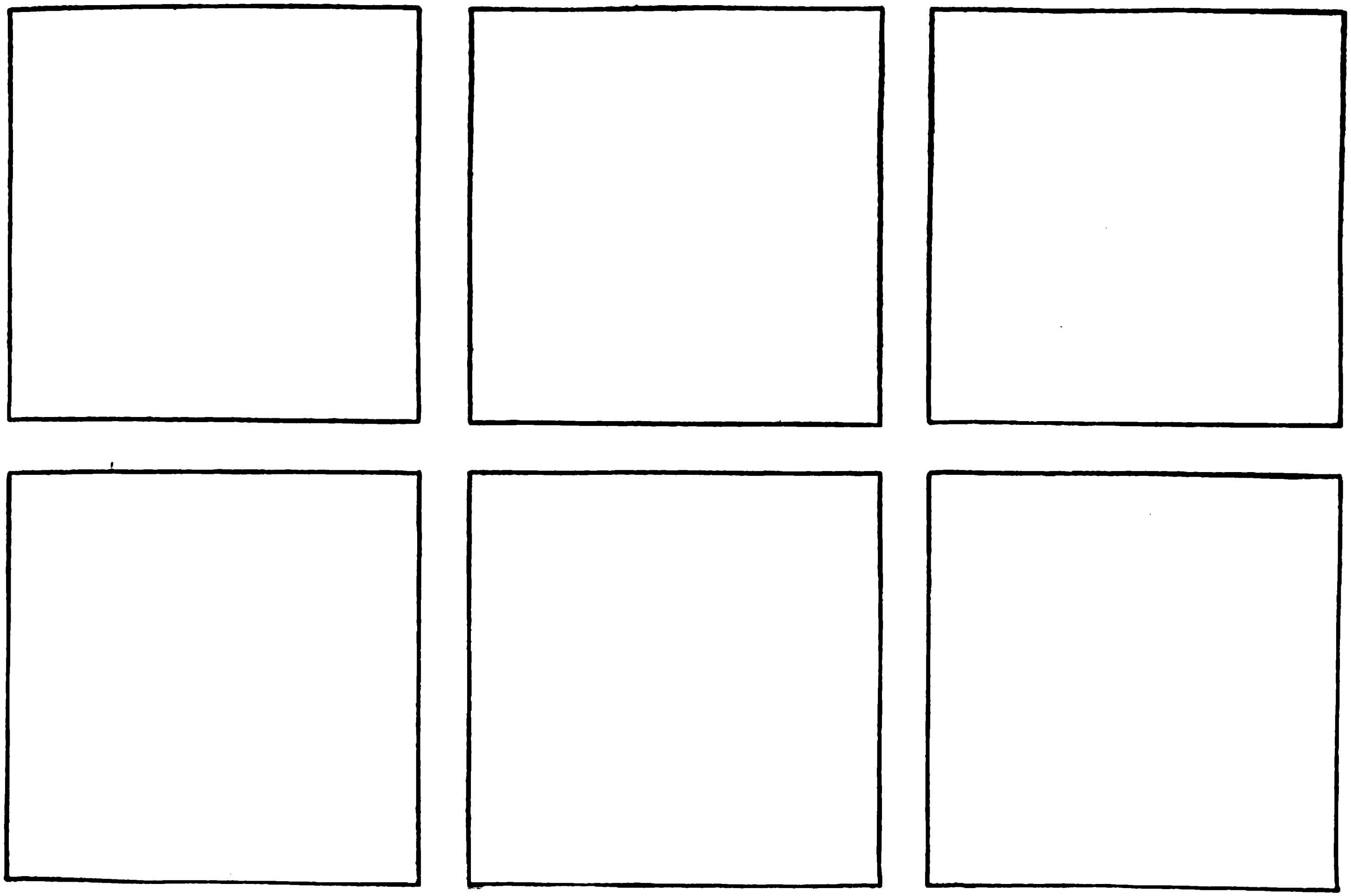

CHART 17

To Be Colored in Five Colors and Five Complementaries in Brilliants

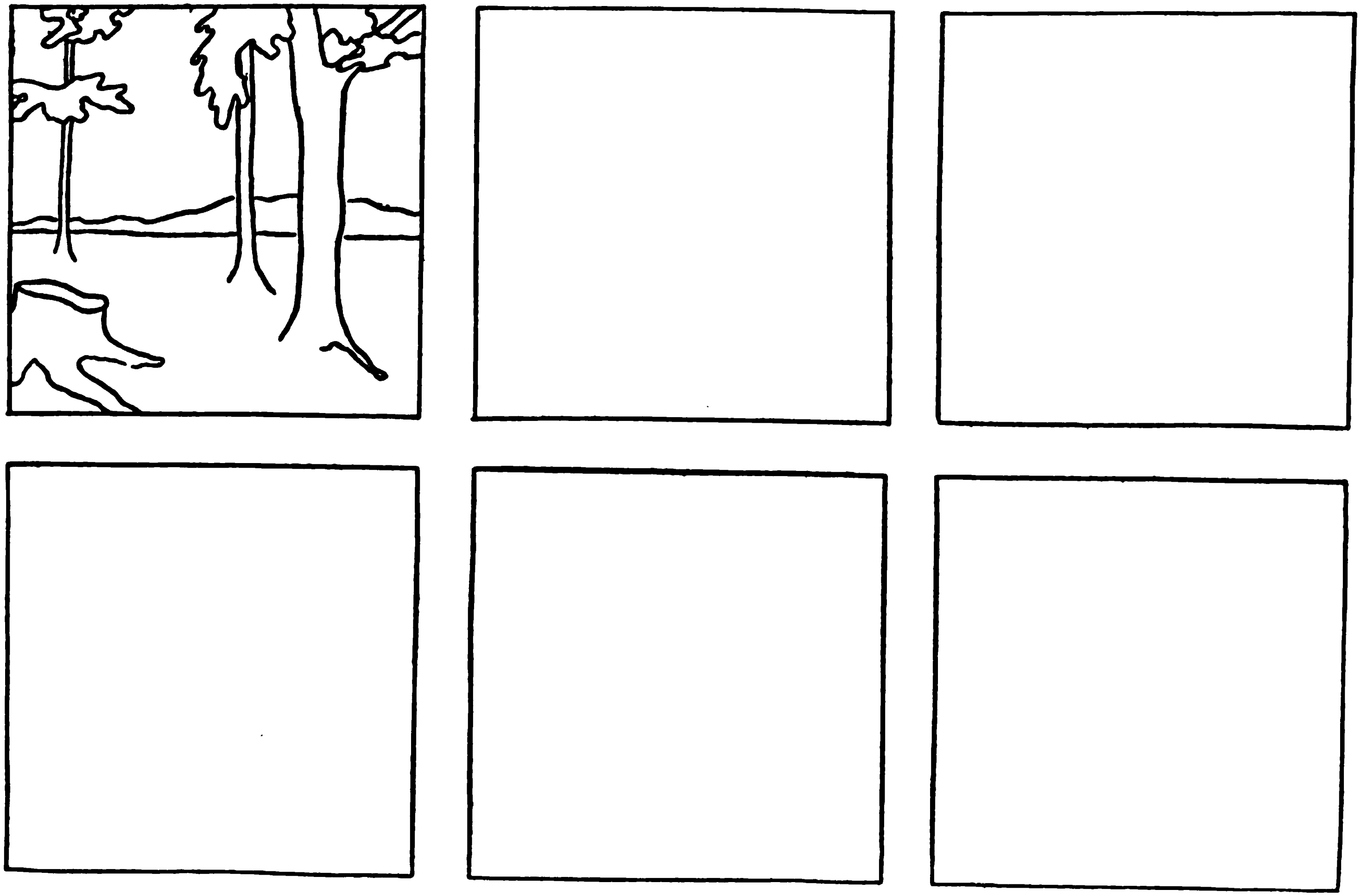

CHART 18

One Color and One Complementary in Neutralized Tones

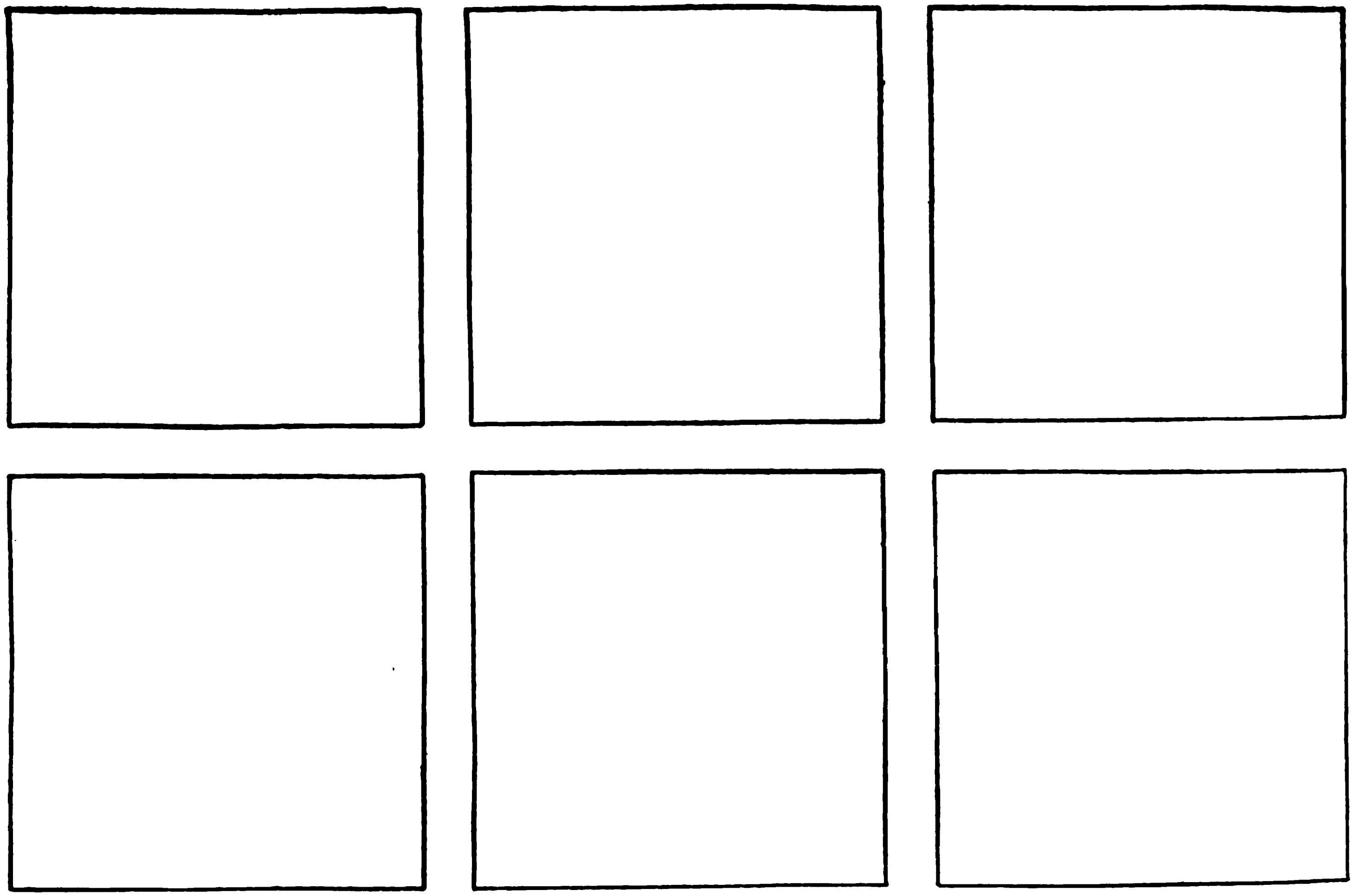

CHART 19

ONE COLOR AND ONE COMPLEMENTARY IN NEUTRALIZED TONES

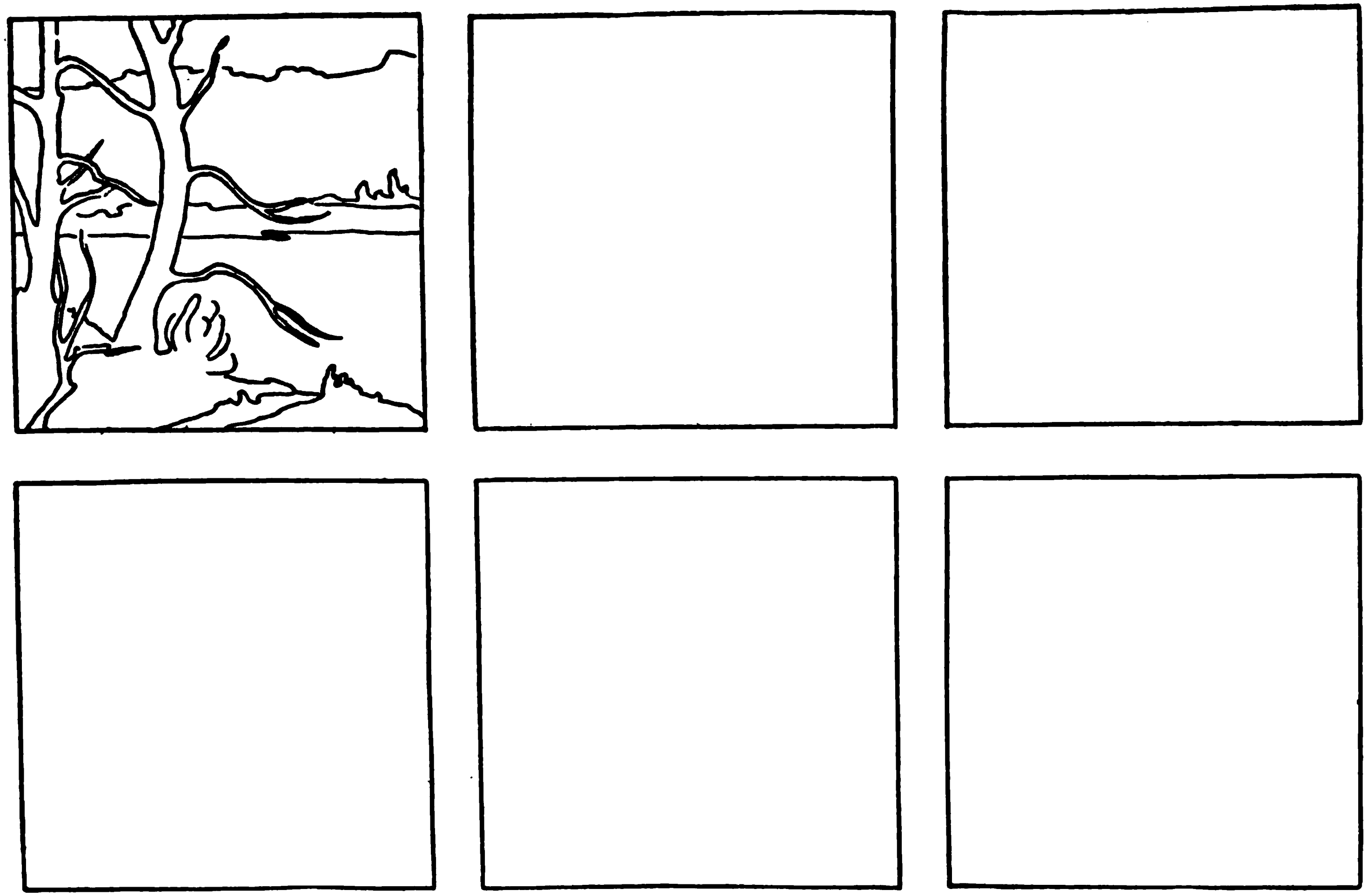

CHART 20

Two Colors and Two Complementaries in Neutralized Tones

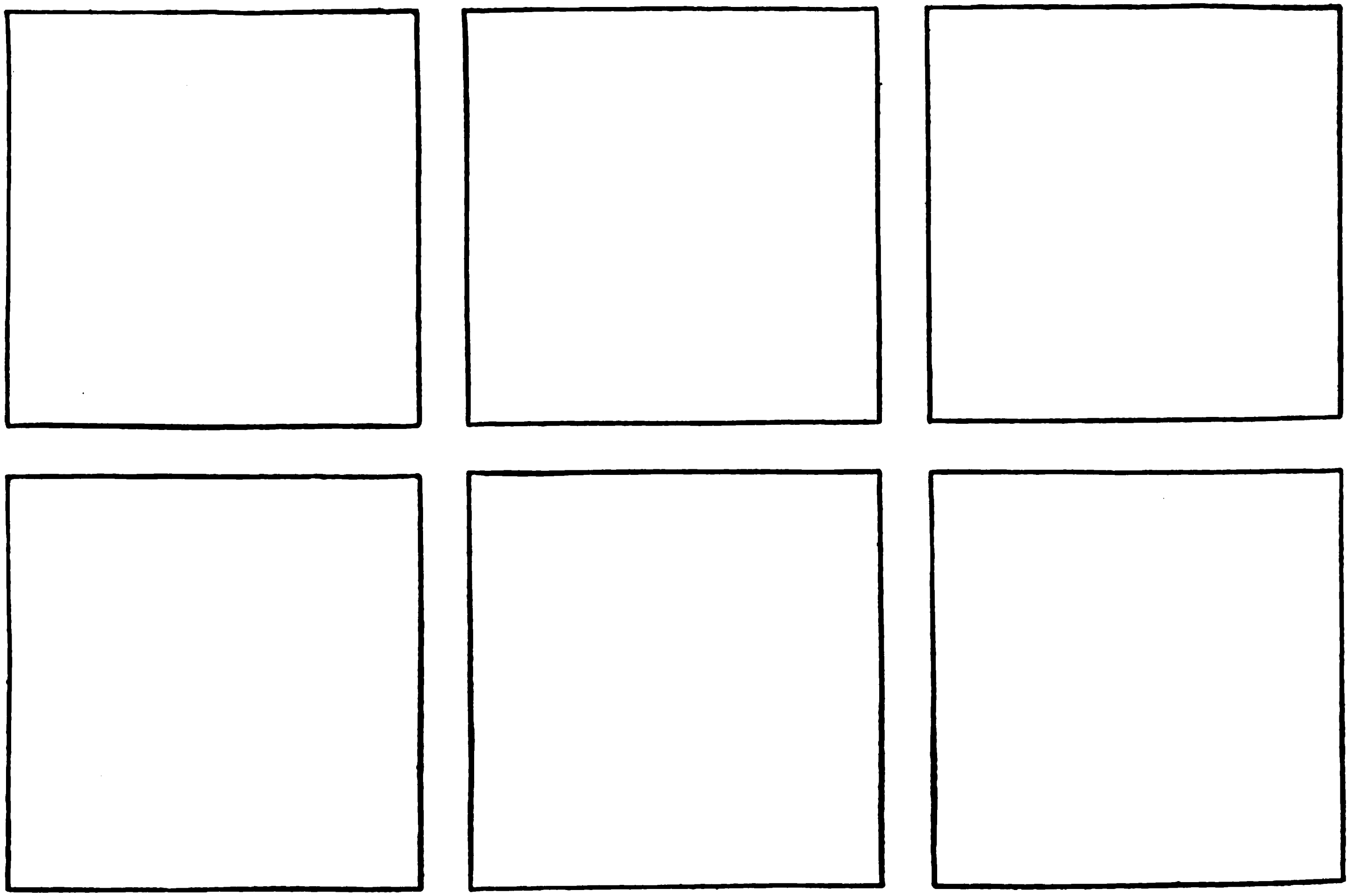

**CHART 21**

Two Colors and Two Complementaries in Neutralized Tones

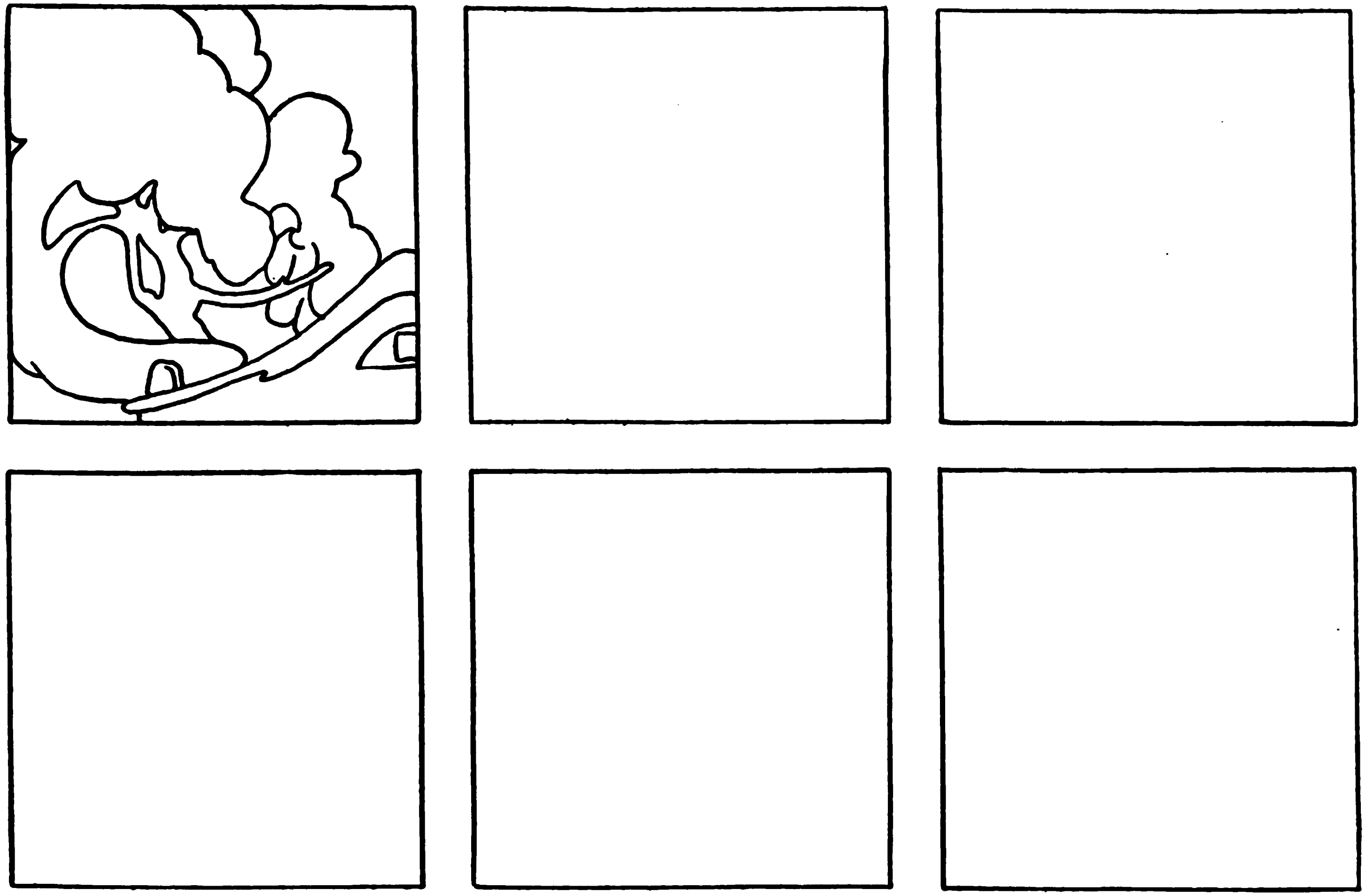

CHART 22

Three Colors and Three Complementaries in Neutralized Tones

Original from UNIVERSITY OF MICHIGAN

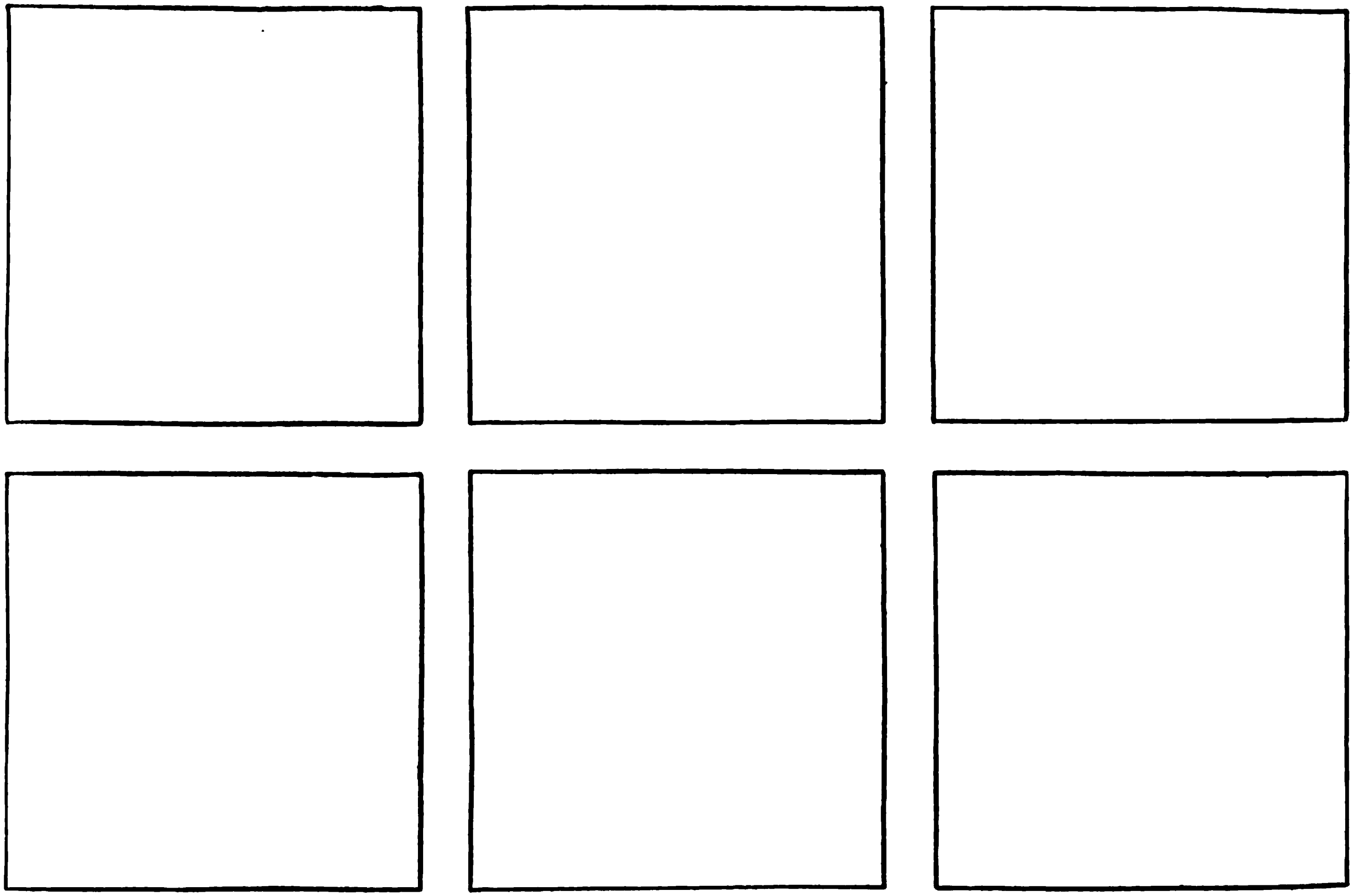

CHART 23

Three Colors and Three Complementaries in Neutralized Tones

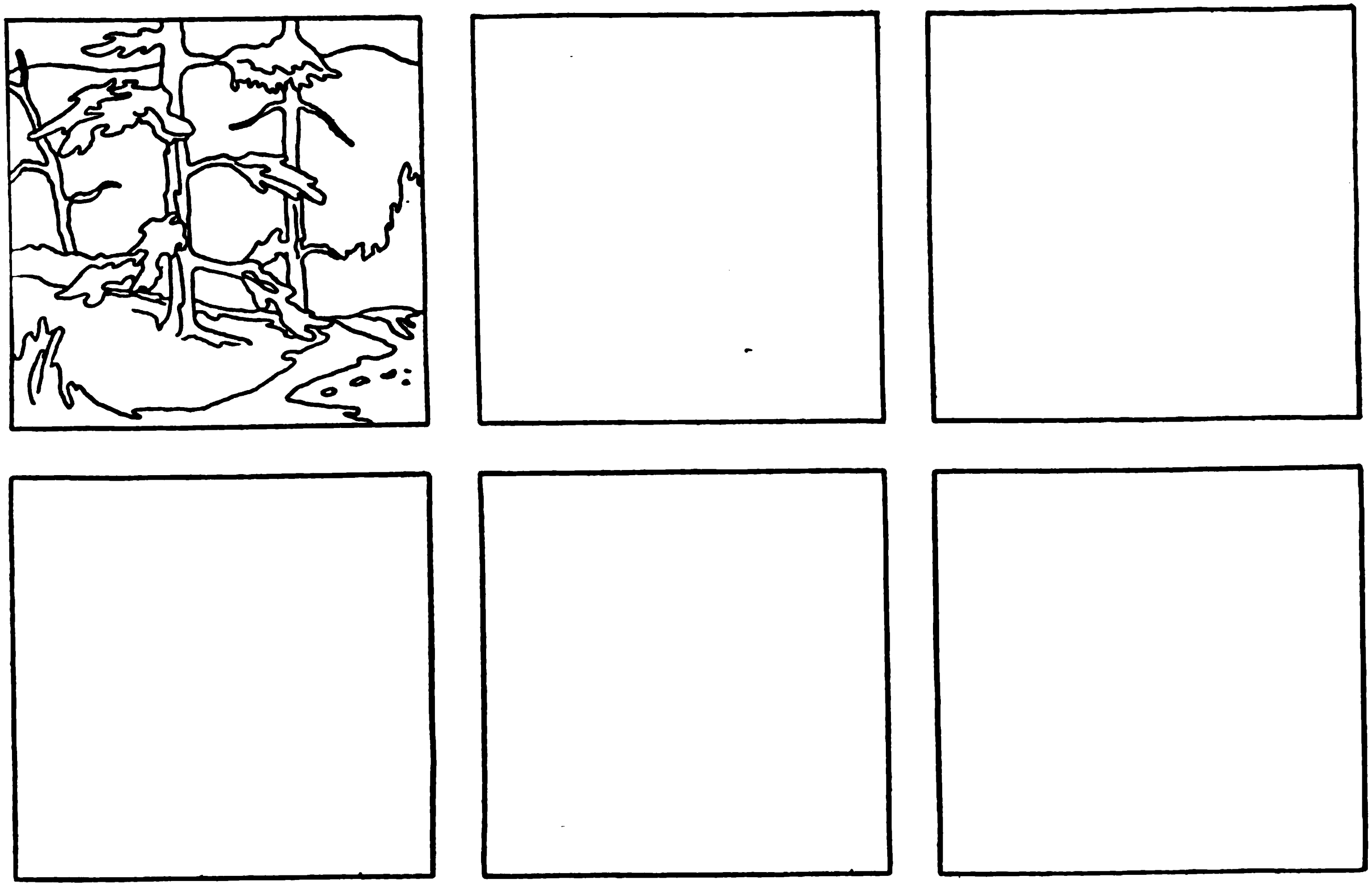

CHART 24

Four Colors and Four Complementaries in Neutralized Tones

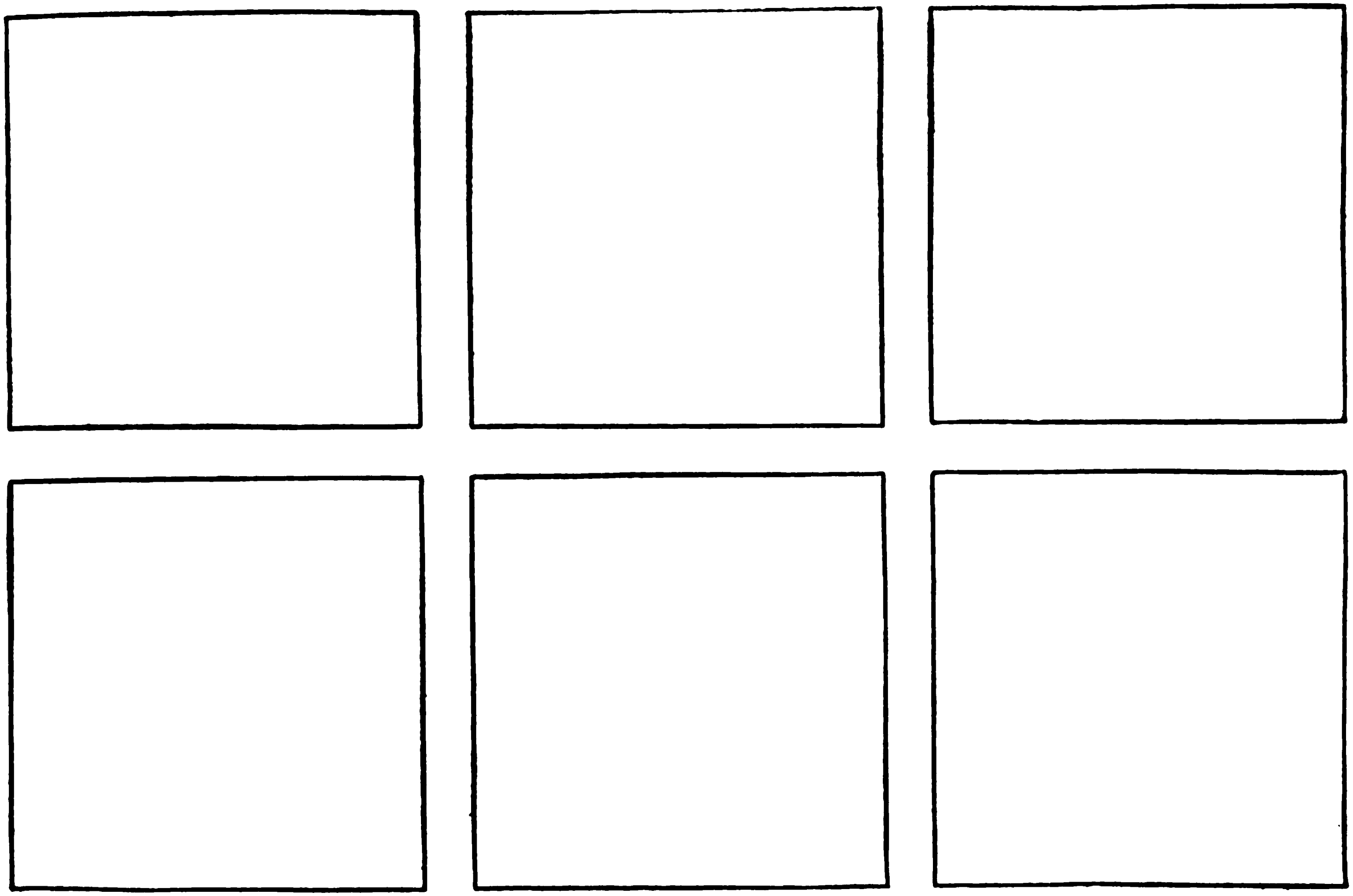

CHART 25

**Four Colors and Four Complementaries in Neutralized Tones**

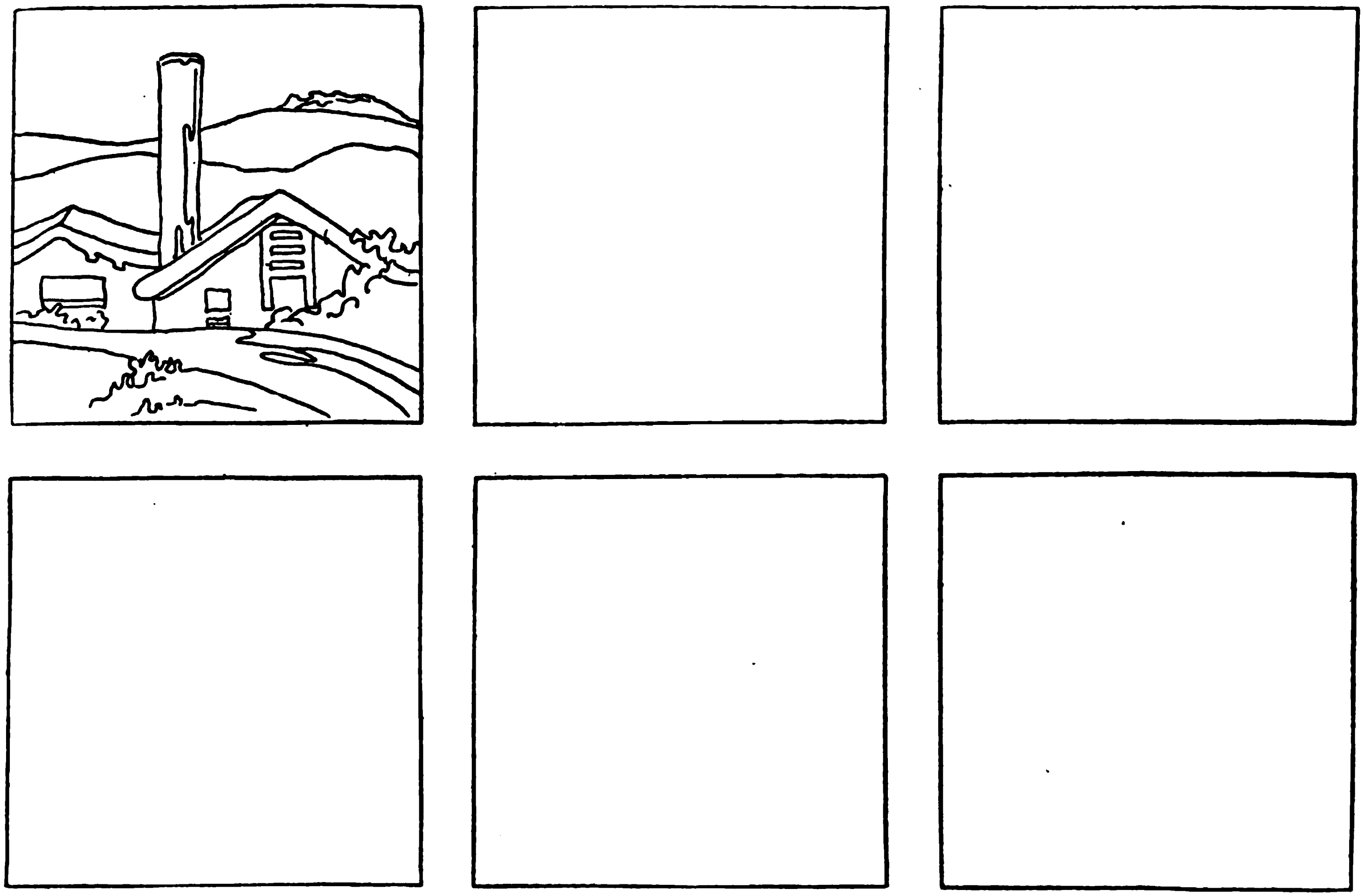

CHART 26

FIVE COLORS AND FIVE COMPLEMENTARIES IN NEUTRALIZED TONES

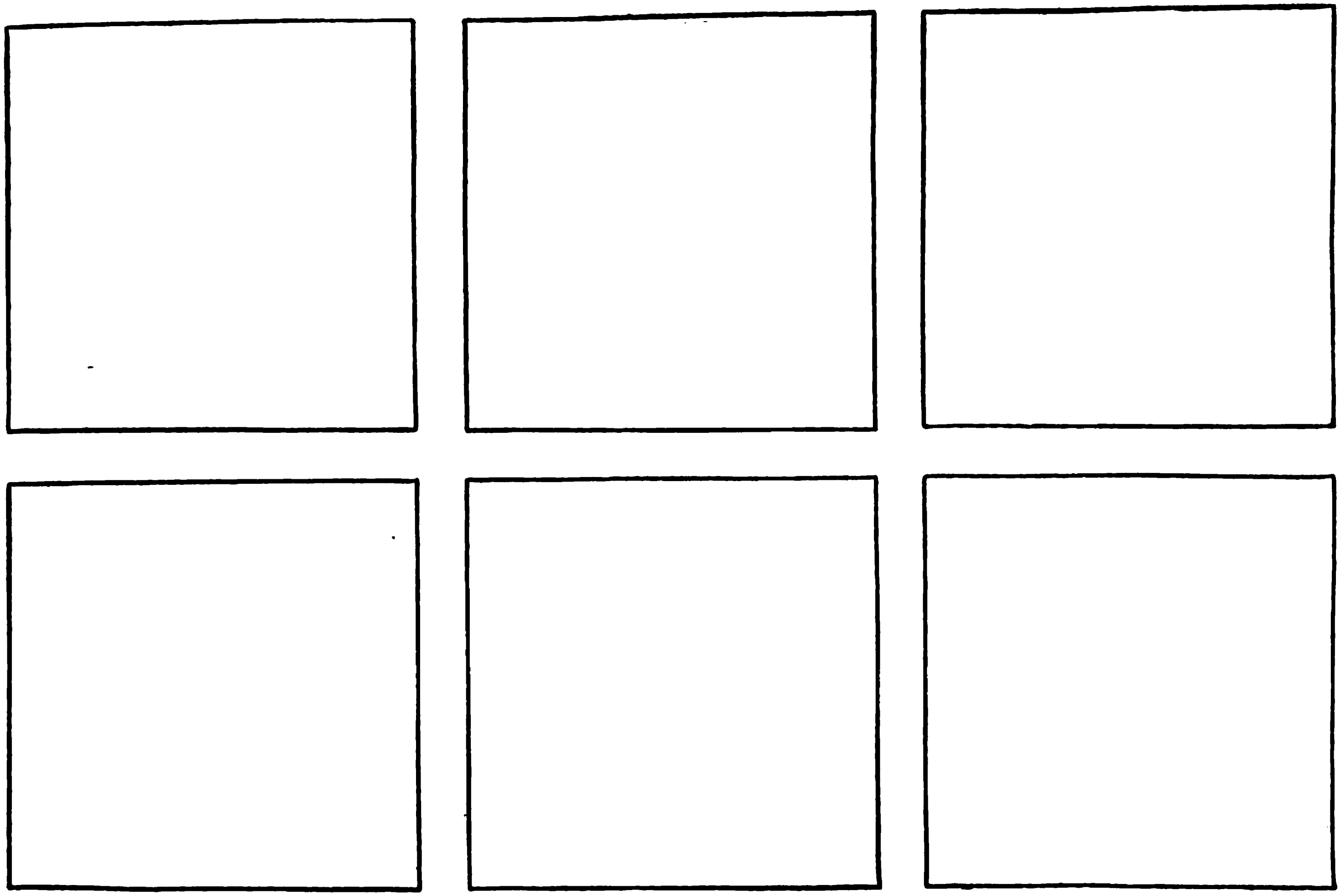

CHART 27

Five Colors and Five Complementaries in Neutralized Tones

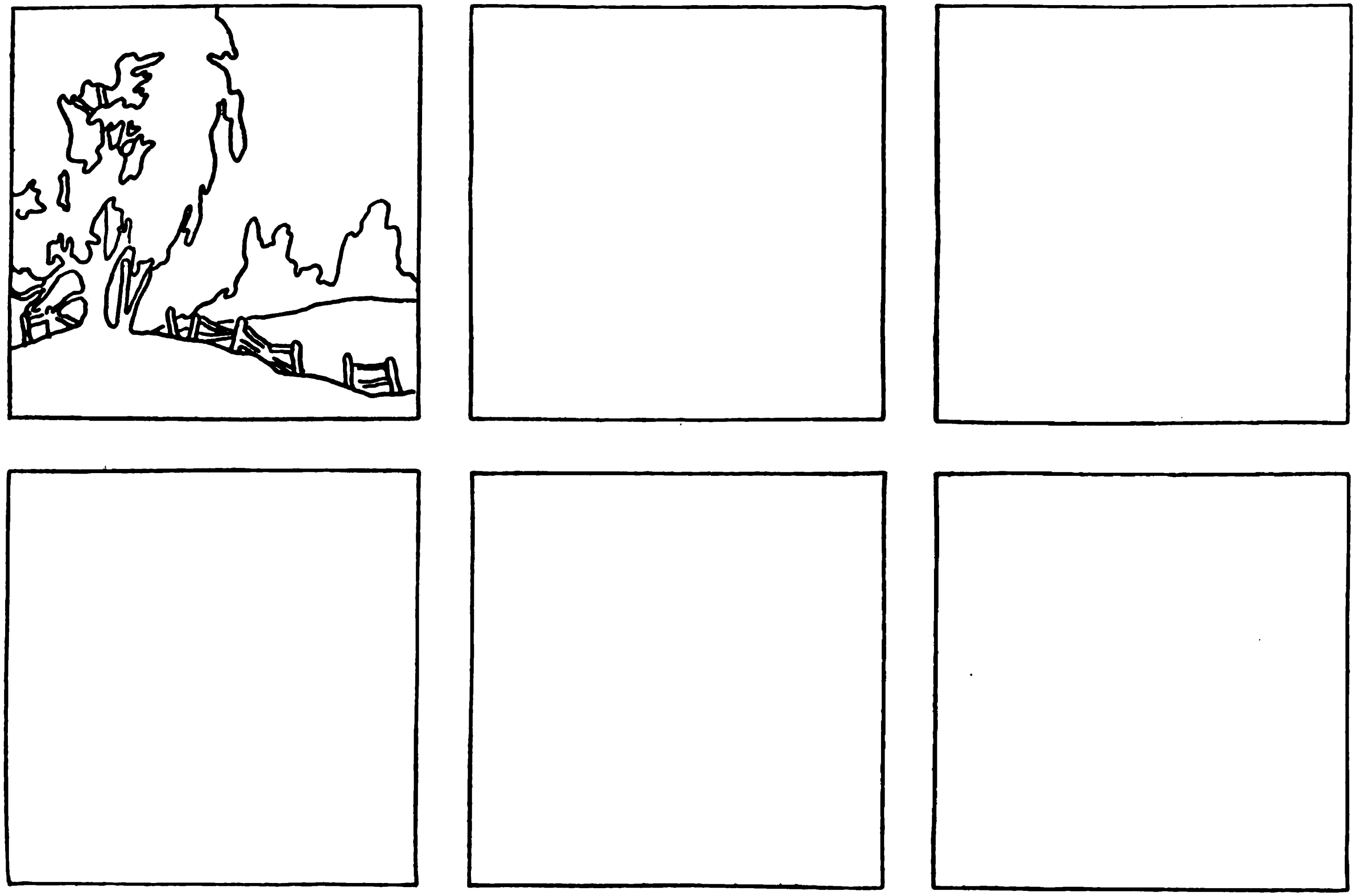

CHART 28

THREE COLORS IN ANALOGOUS HARMONY IN BRILLIANTS

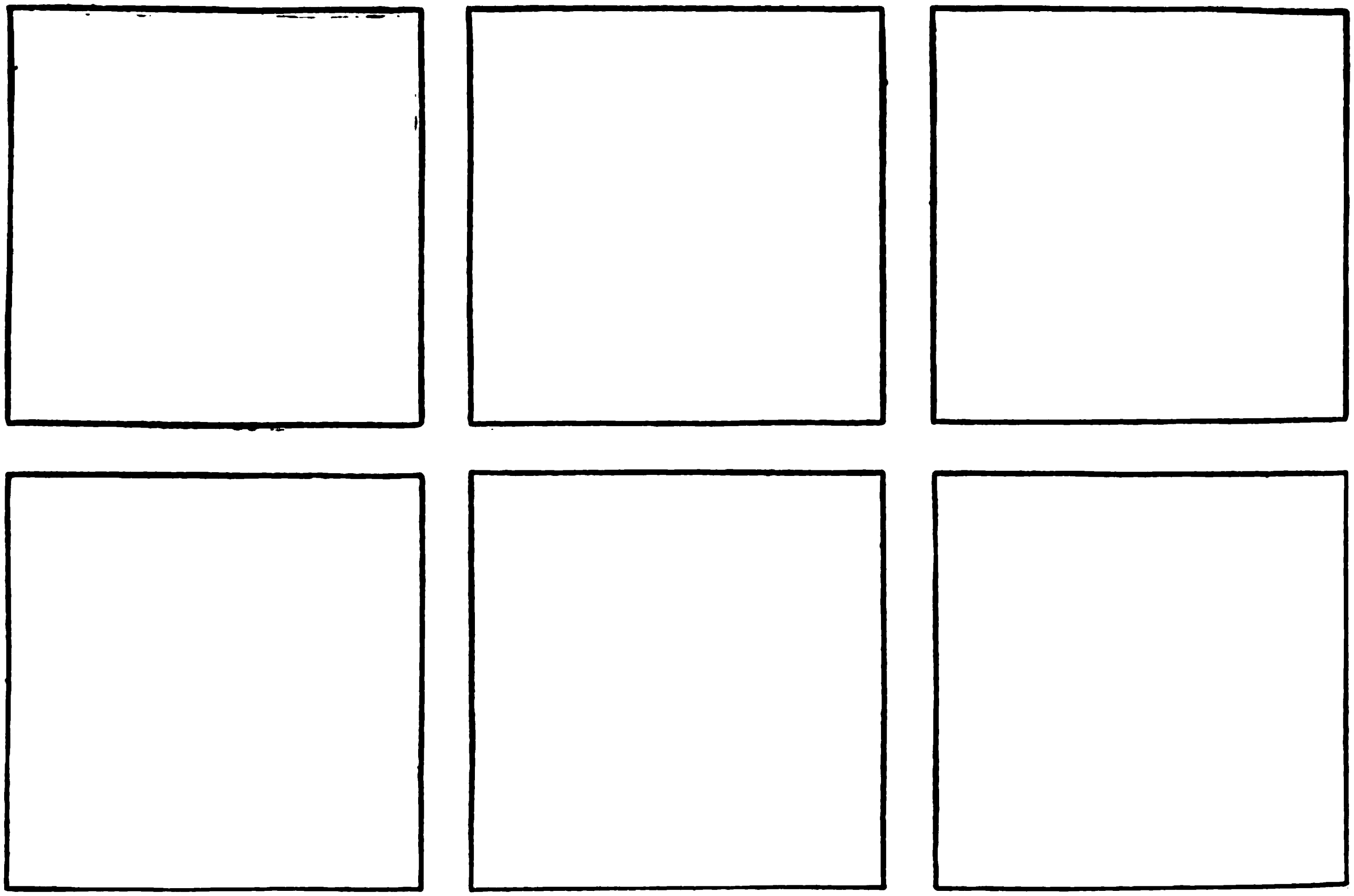

CHART 29

THREE COLORS IN ANALOGOUS HARMONY IN BRILLIANTS

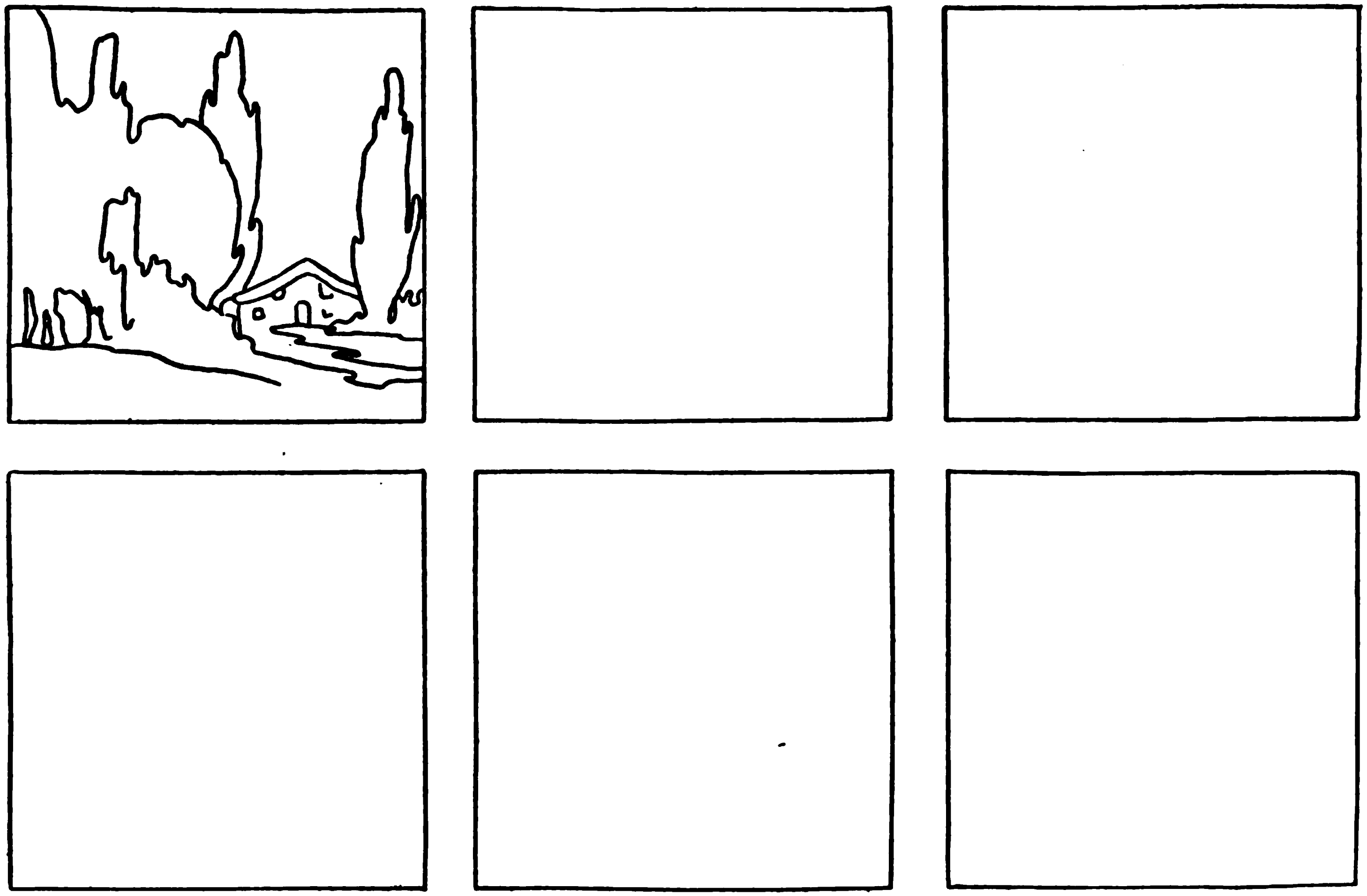

CHART 30

Four Colors in Analogous Harmony in Brilliants

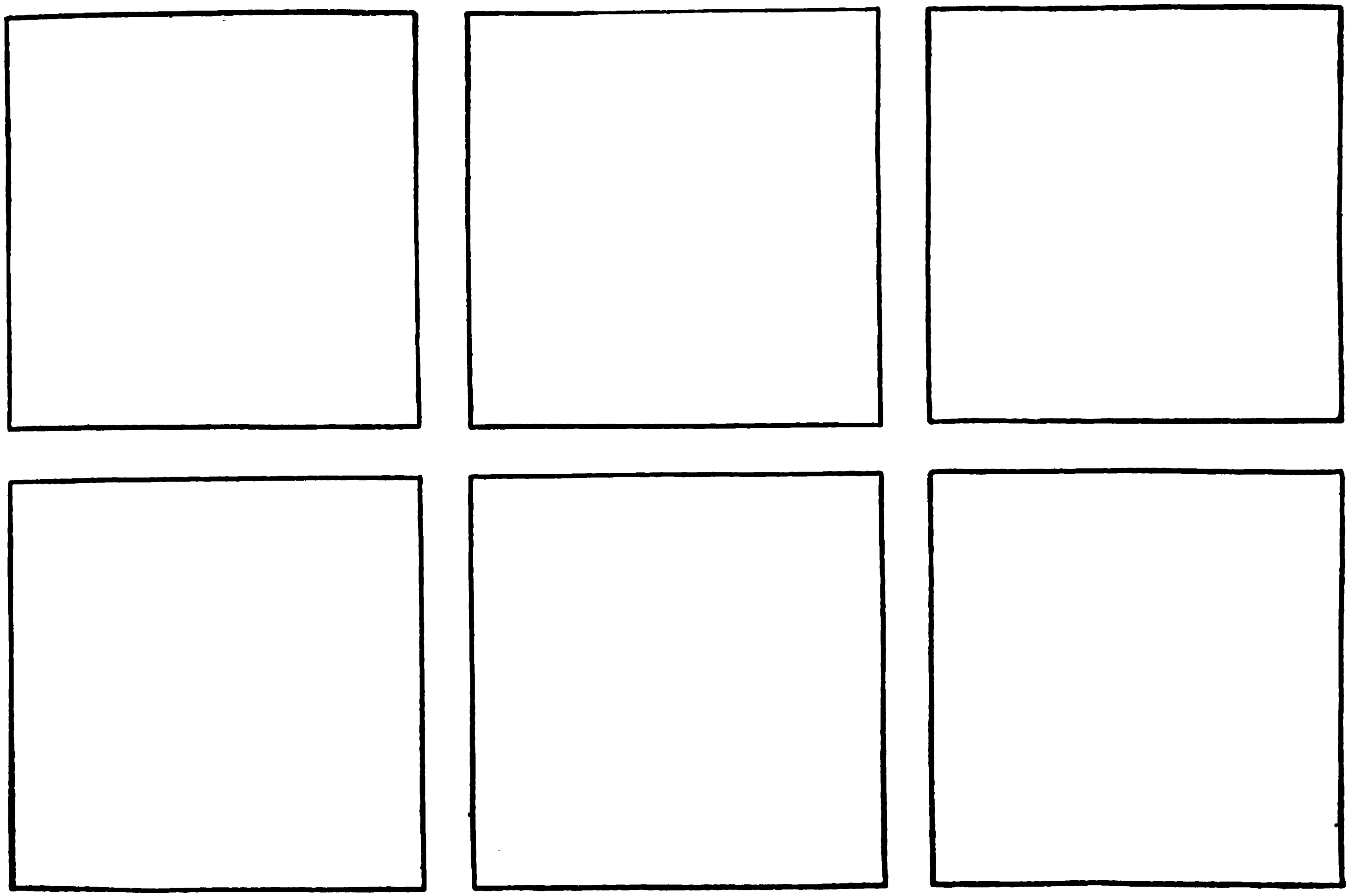

CHART 31

FOUR COLORS IN ANALOGOUS HARMONY IN BRILLIANTS

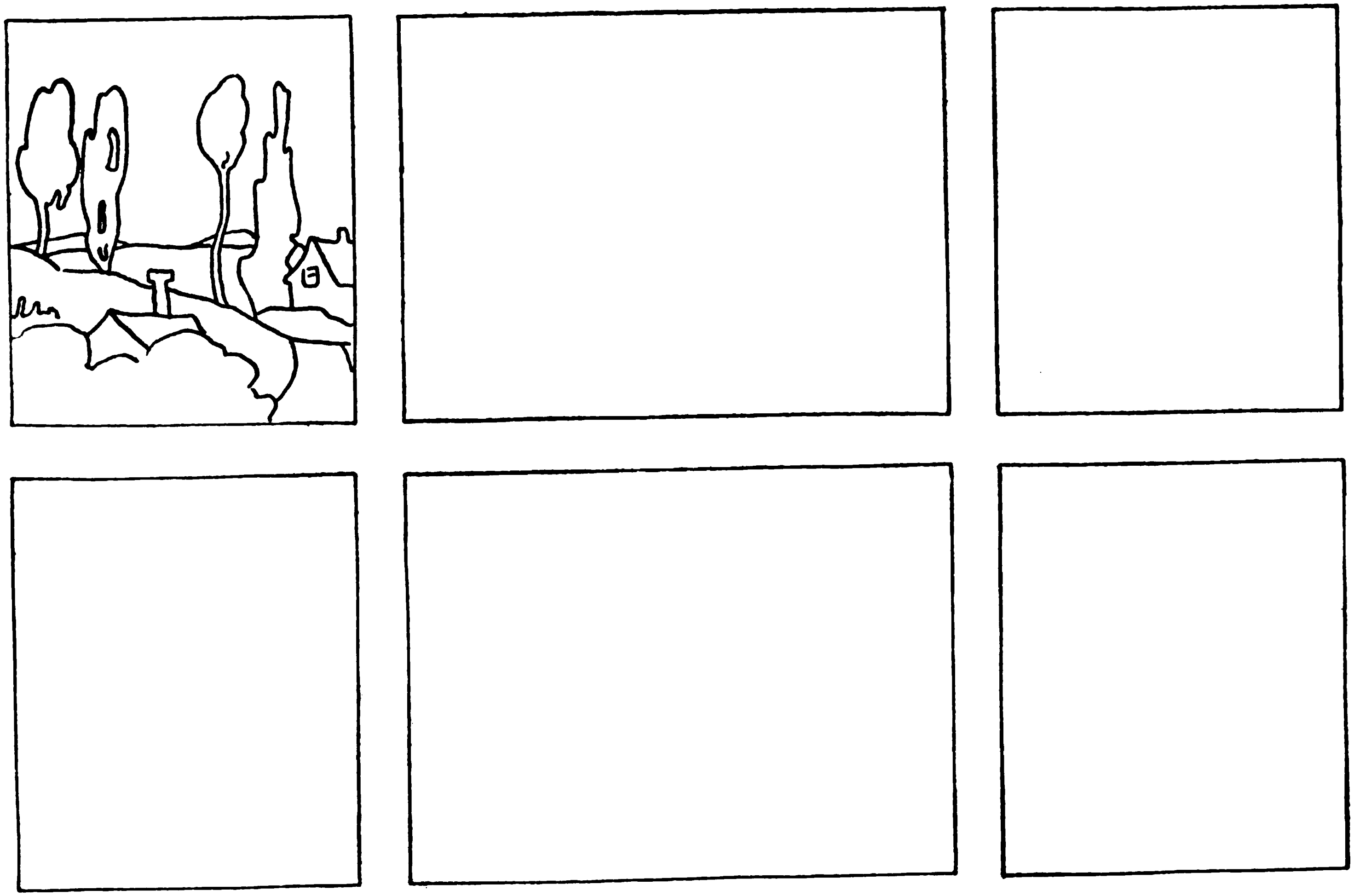

CHART 32

Five Colors in Analogous Harmony in Brilliants

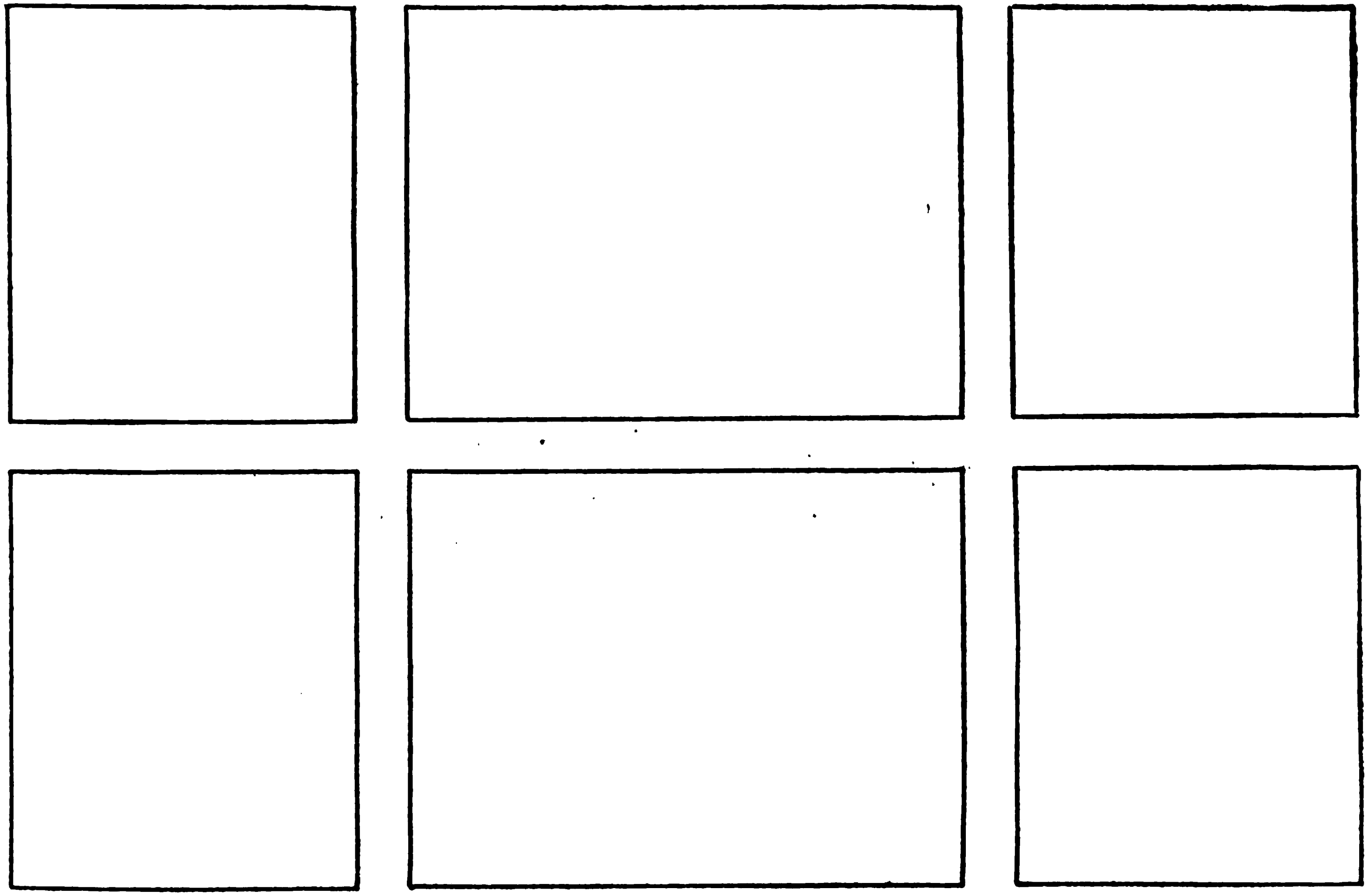

CHART 33

FIVE COLORS IN ANALOGOUS HARMONY IN BRILLIANTS

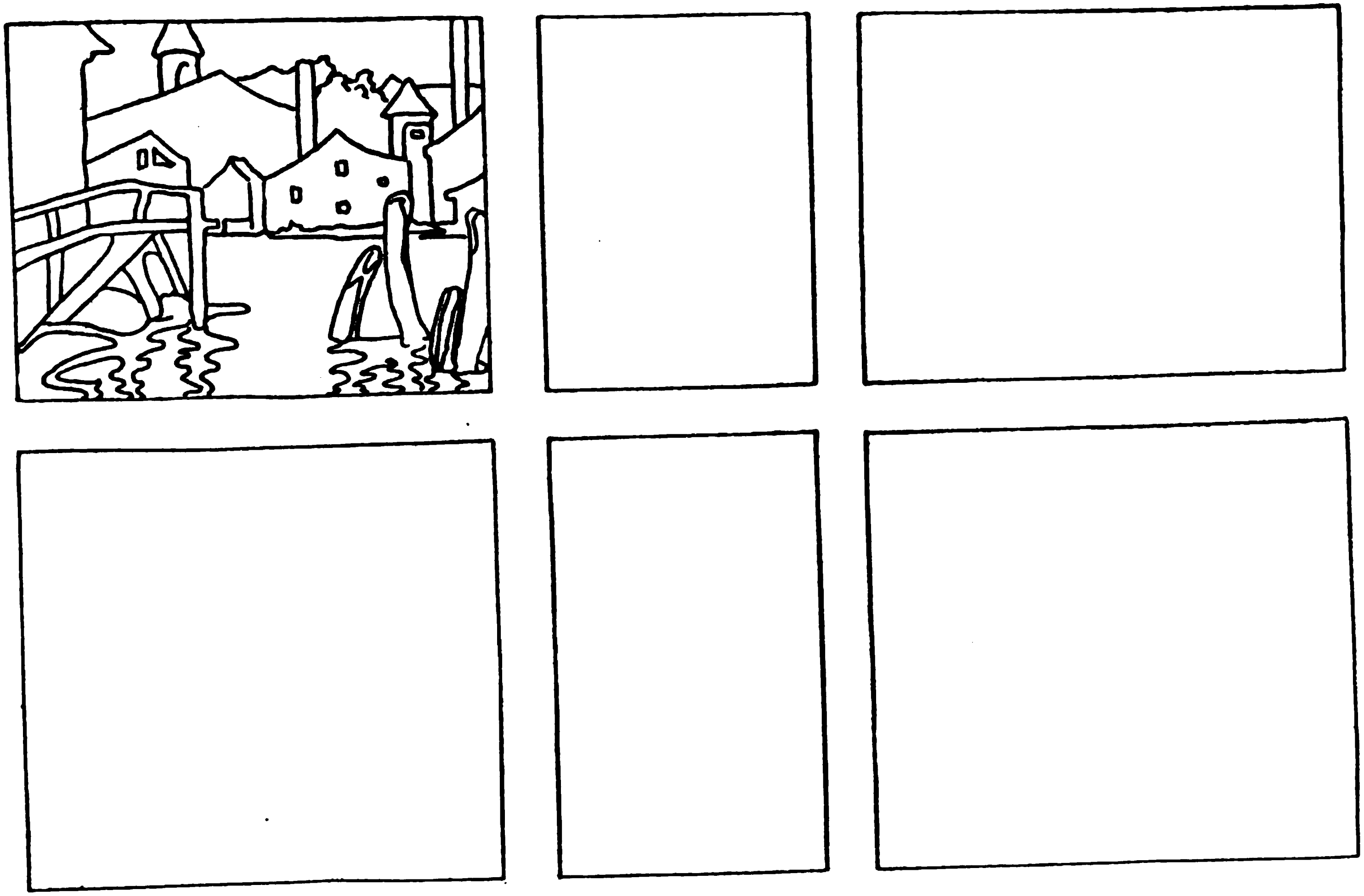

CHART 34

Six Colors in Analogous Harmony in Brilliants

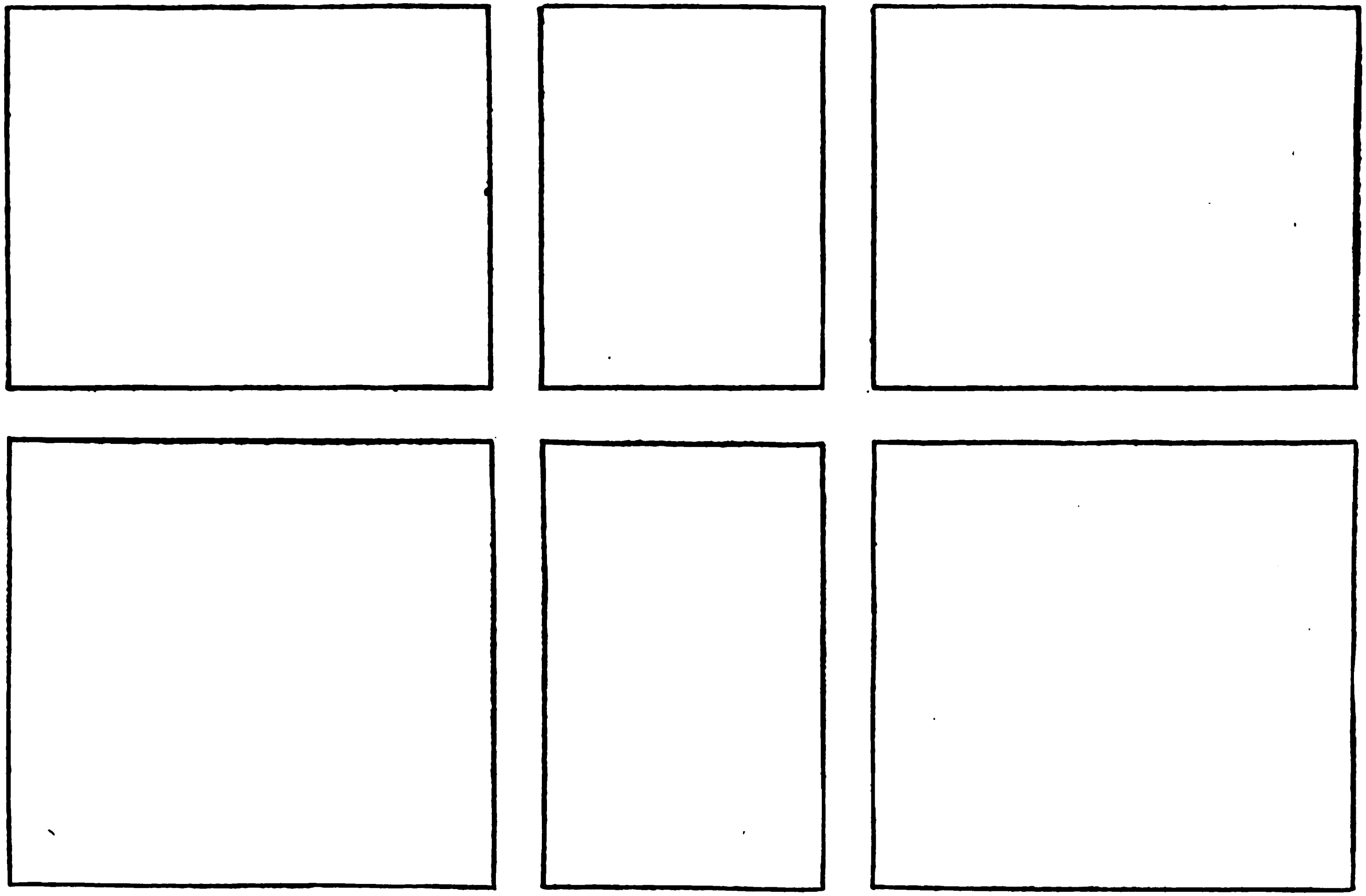

CHART 35

Six Colors in Analogous Harmony in Brilliants

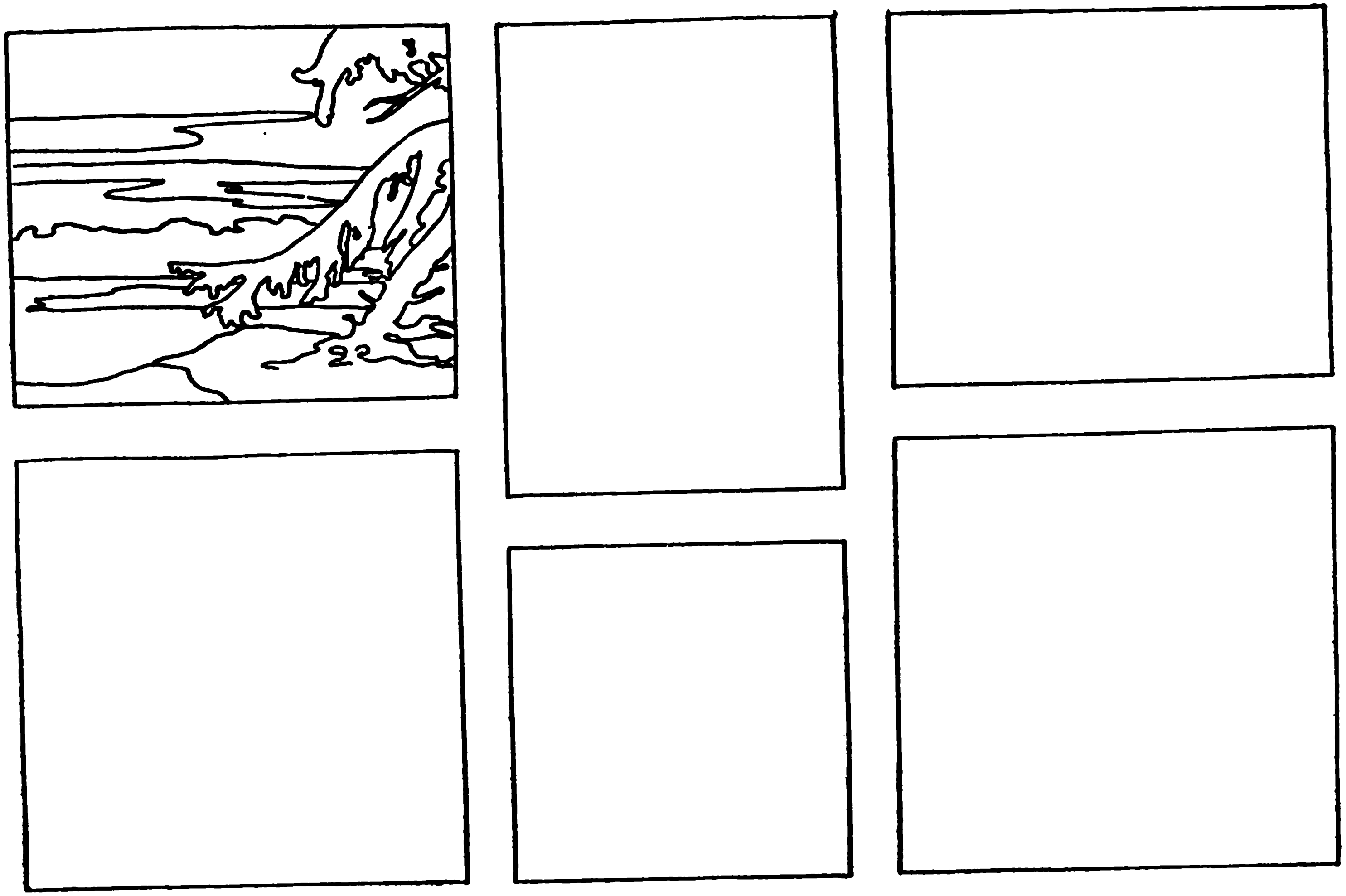

CHART 36

Three Colors in Analogous Harmony in Neutralized Tones

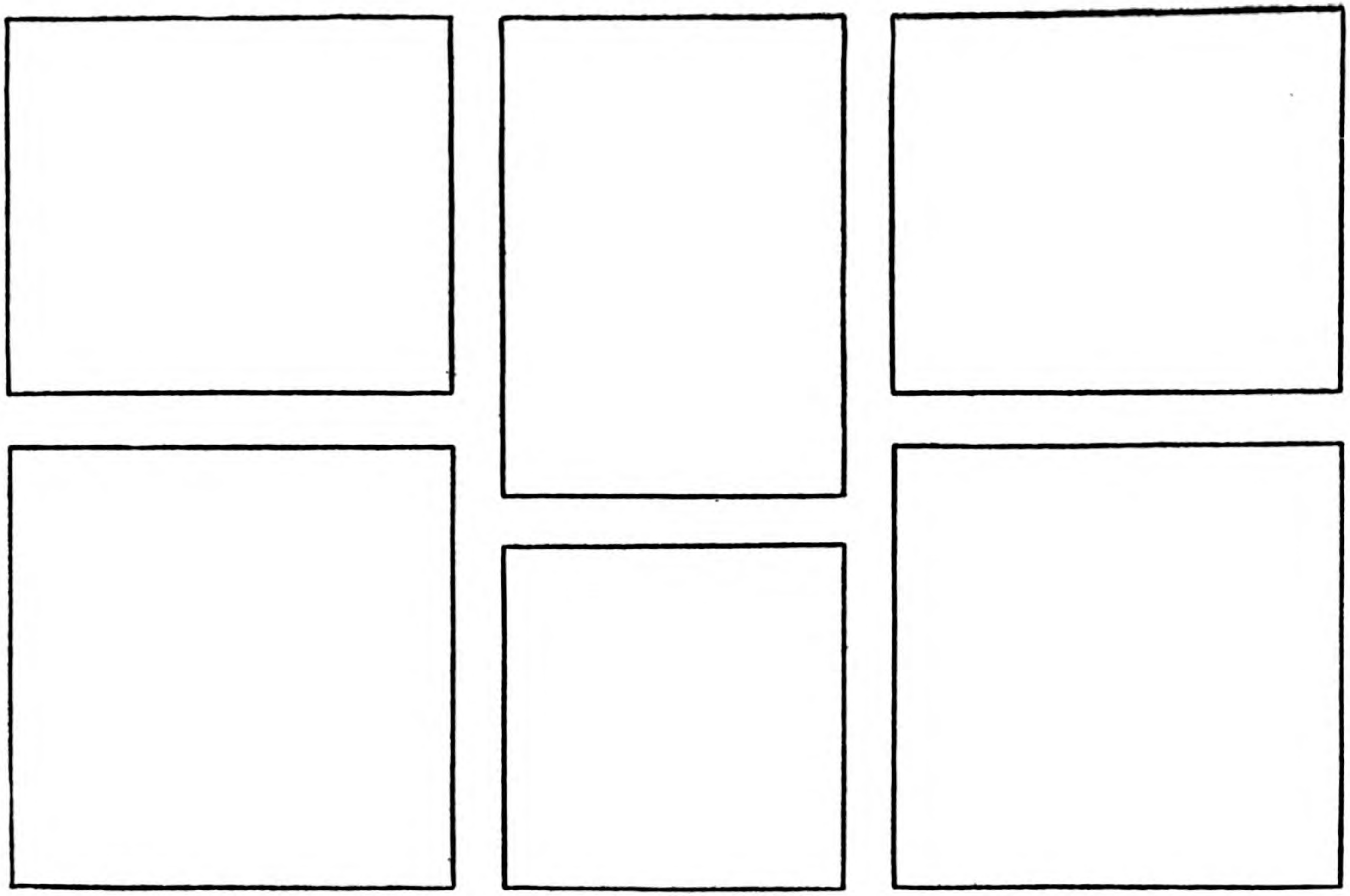

CHART 37

THREE COLORS IN ANALOGOUS HARMONY IN NEUTRALIZED TONES

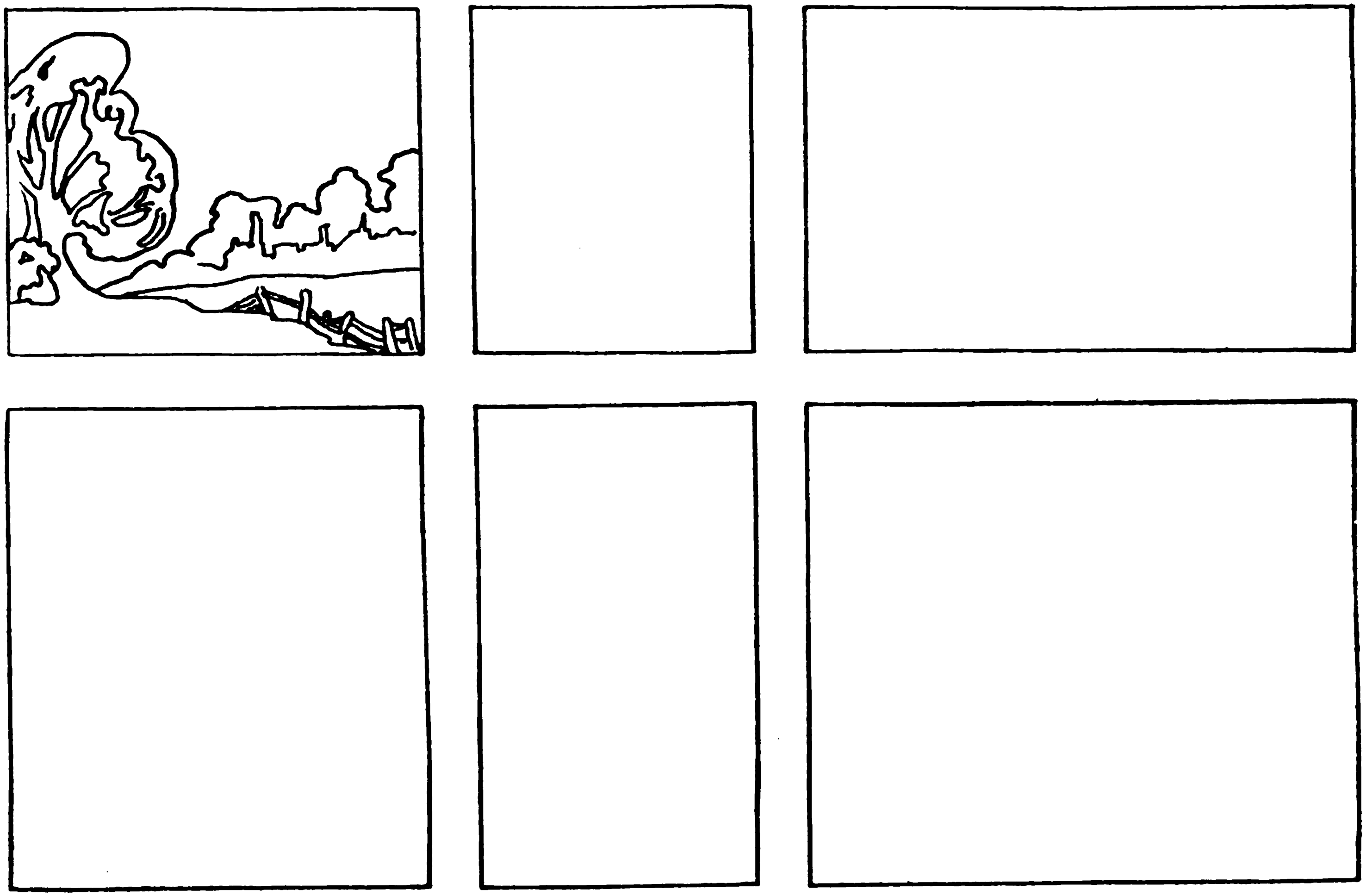

CHART 38

FOUR COLORS IN ANALOGOUS HARMONY IN NEUTRALIZED TONES

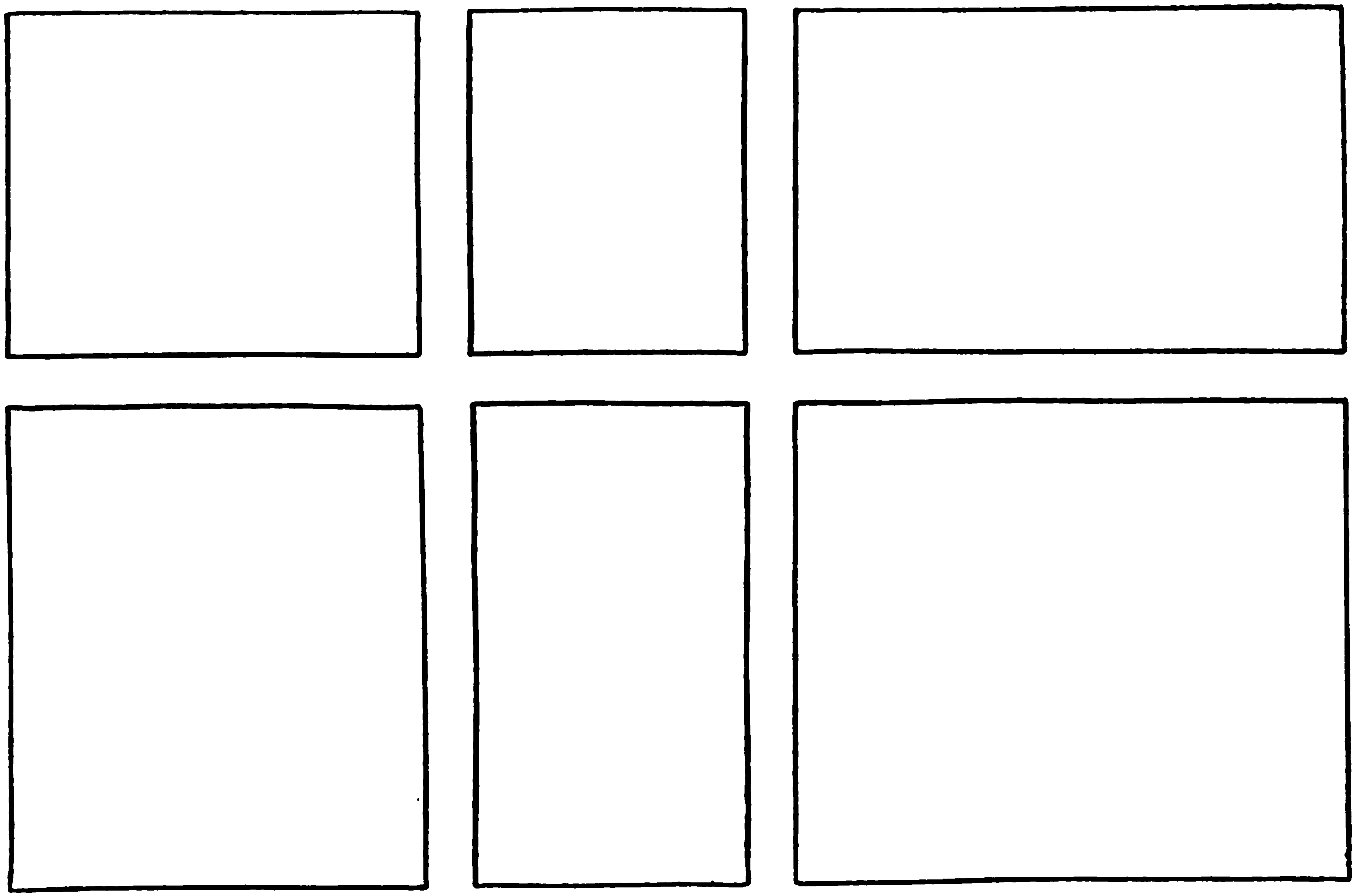

CHART 39

FOUR COLORS IN ANALOGOUS HARMONY IN NEUTRALIZED TONES

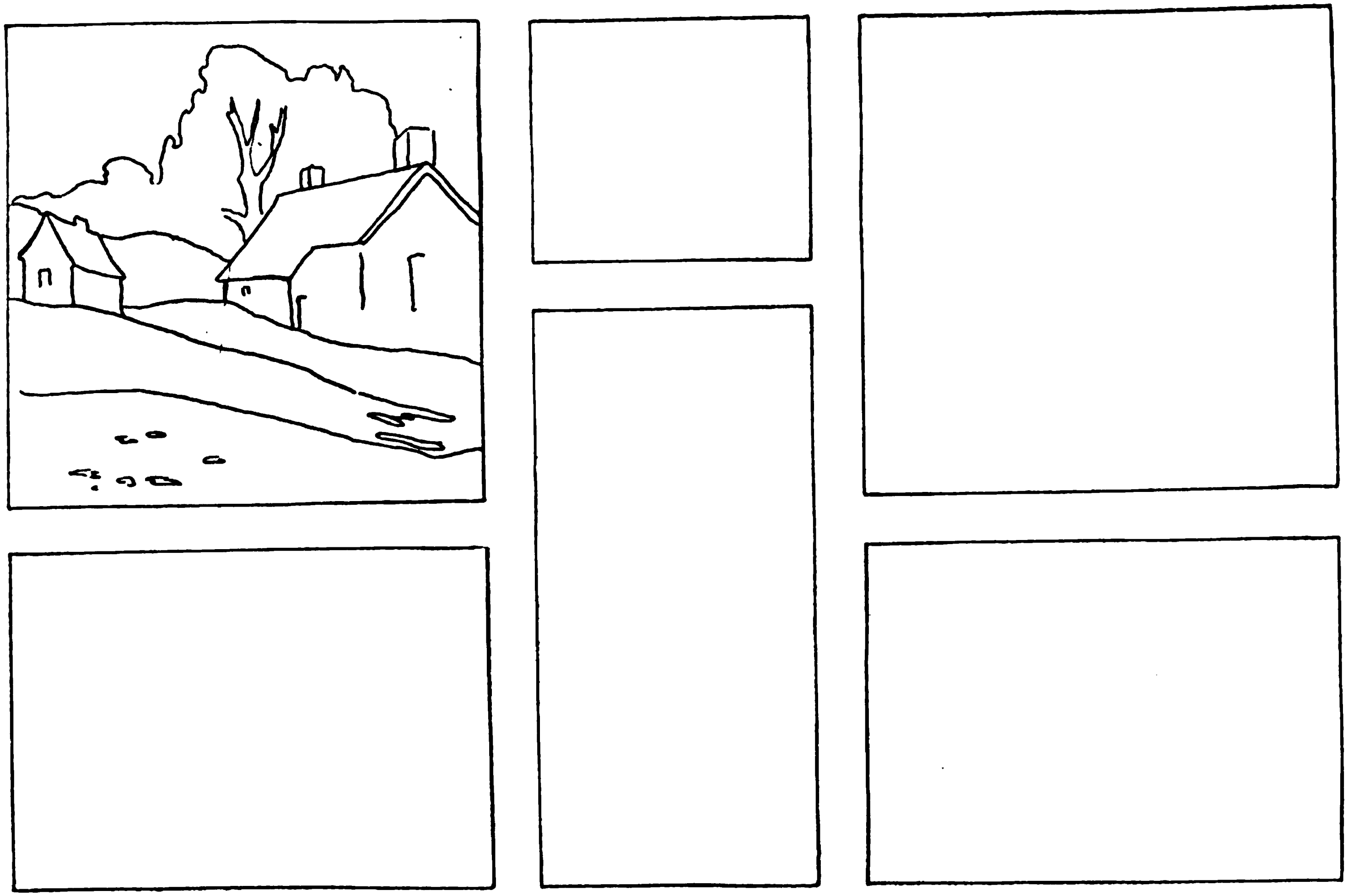

CHART 40

FIVE COLORS IN ANALOGOUS HARMONY IN NEUTRALIZED TONES

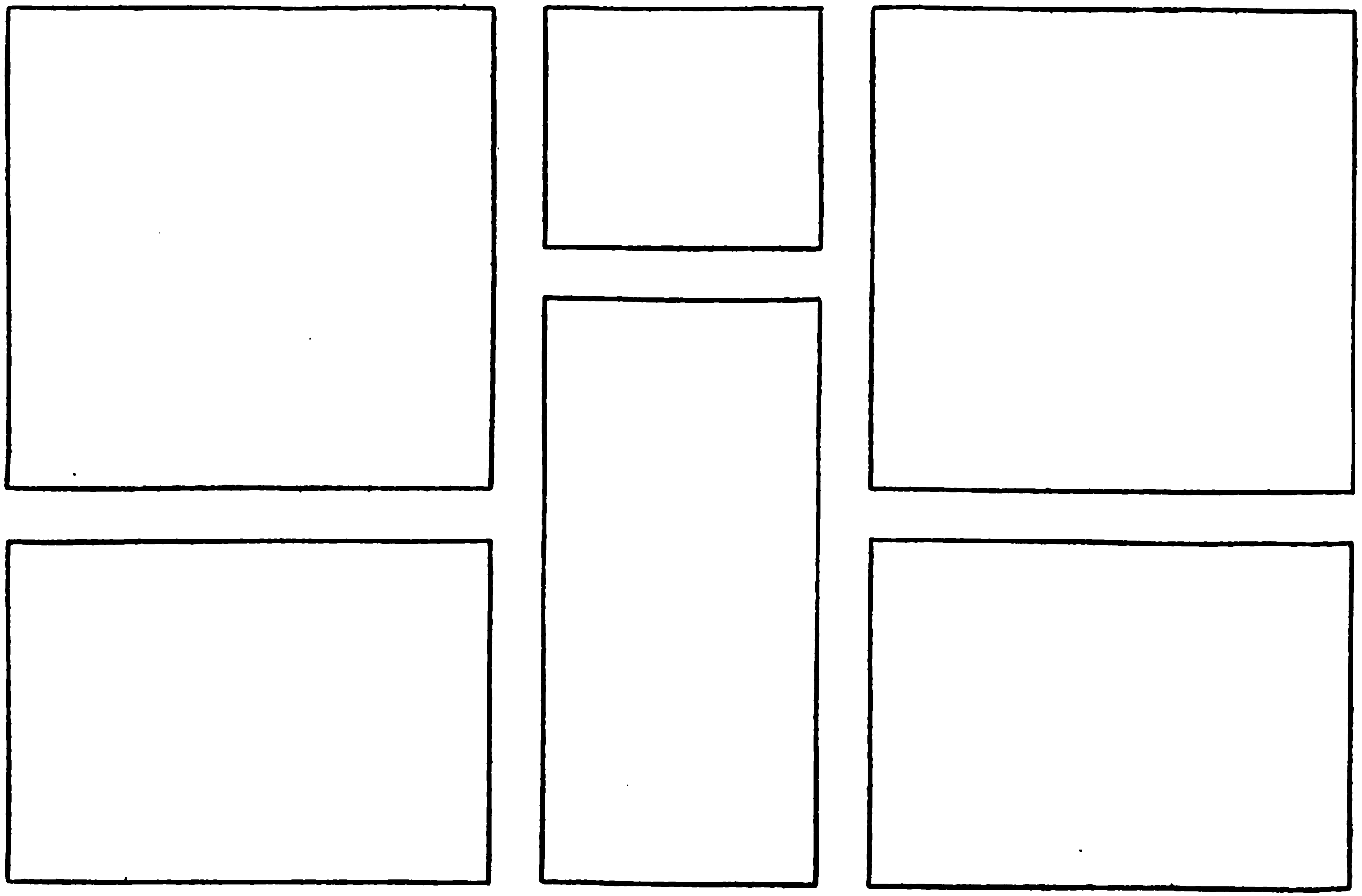

CHART 41

FIVE COLORS IN ANALOGOUS HARMONY IN NEUTRALIZED TONES

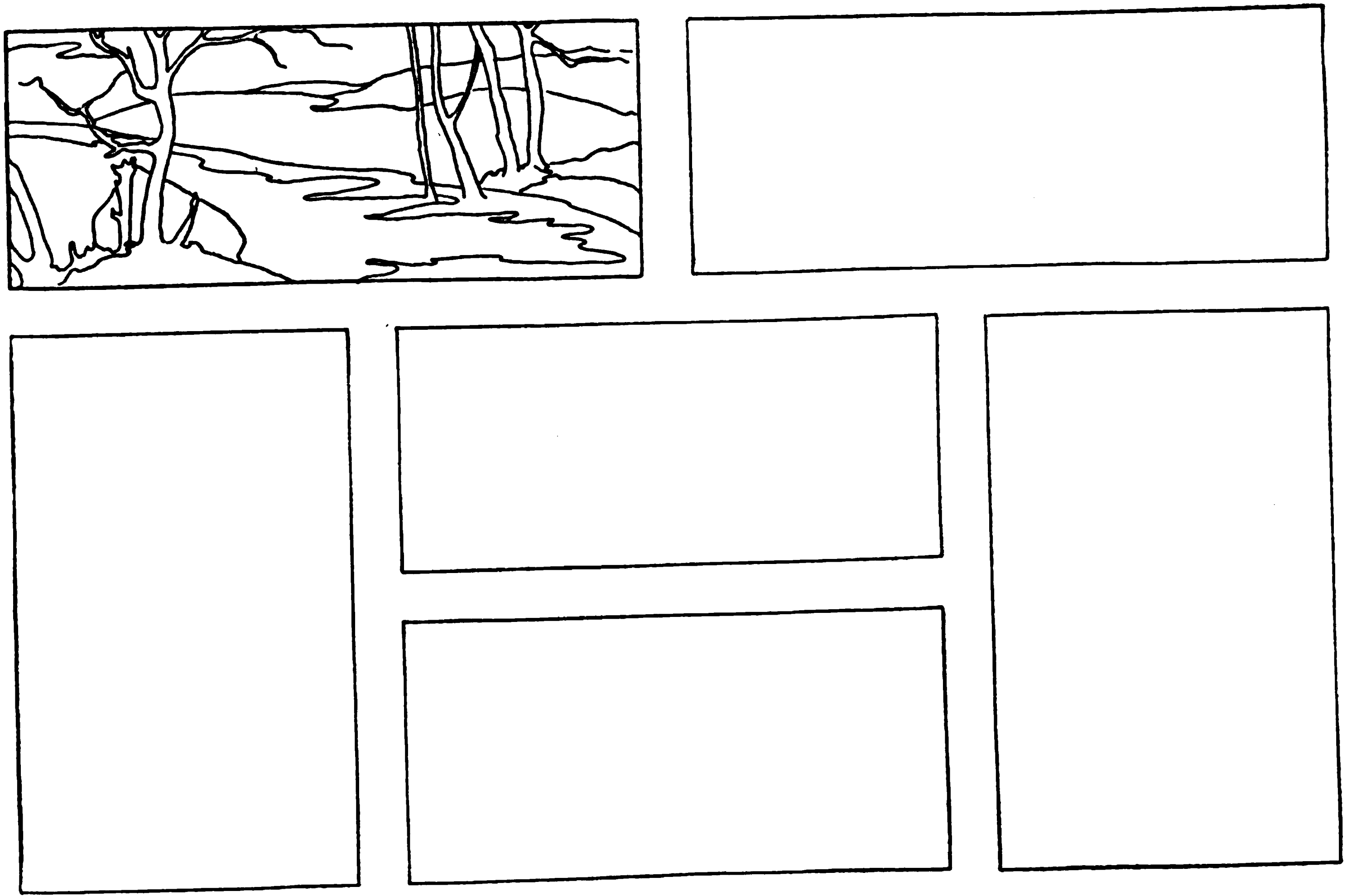

CHART 42

SIX COLORS IN ANALOGOUS HARMONY IN NEUTRALIZED TONES

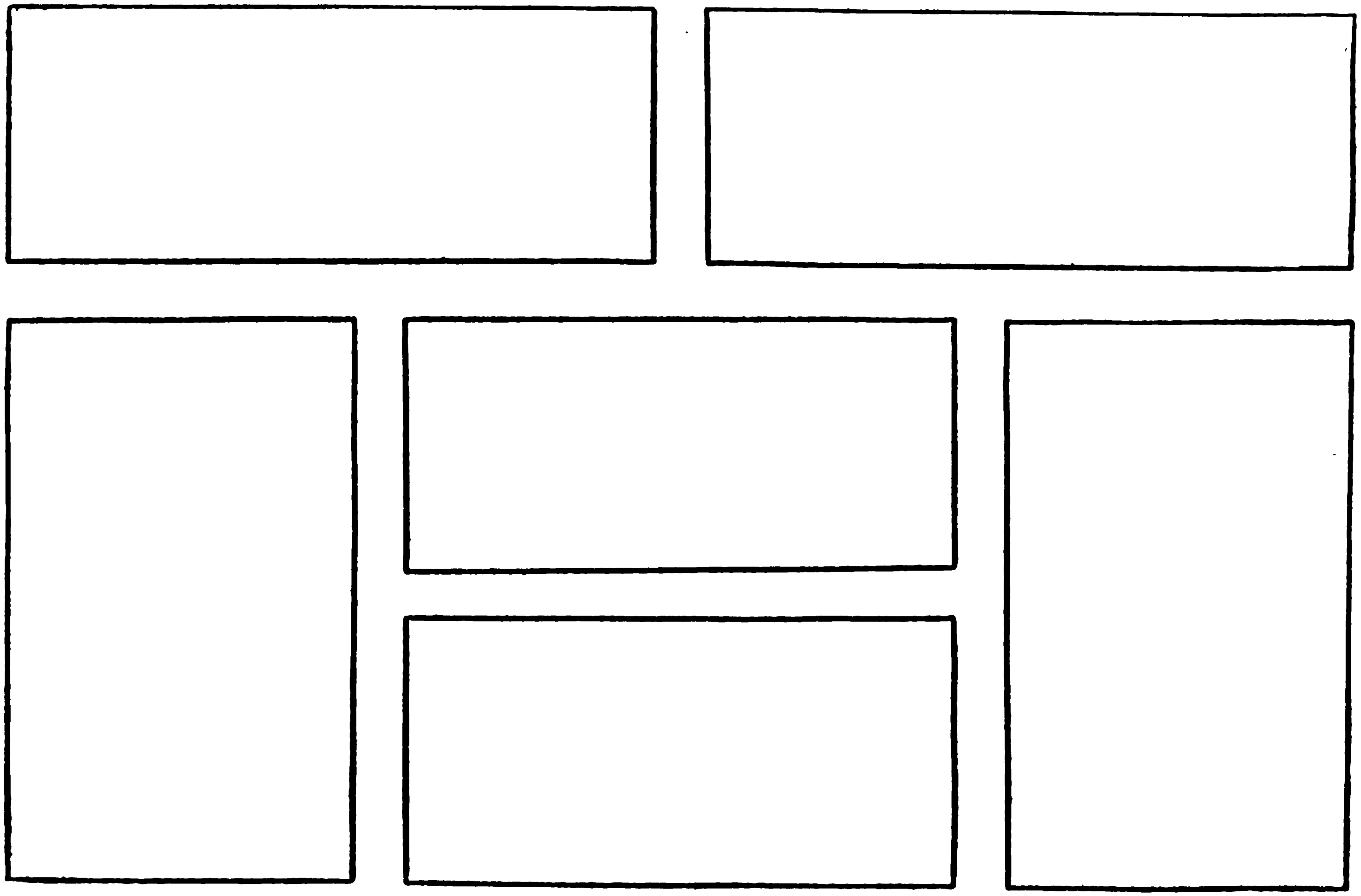

CHART 43

Six Colors in Analogous Harmony in Neutralized Tones

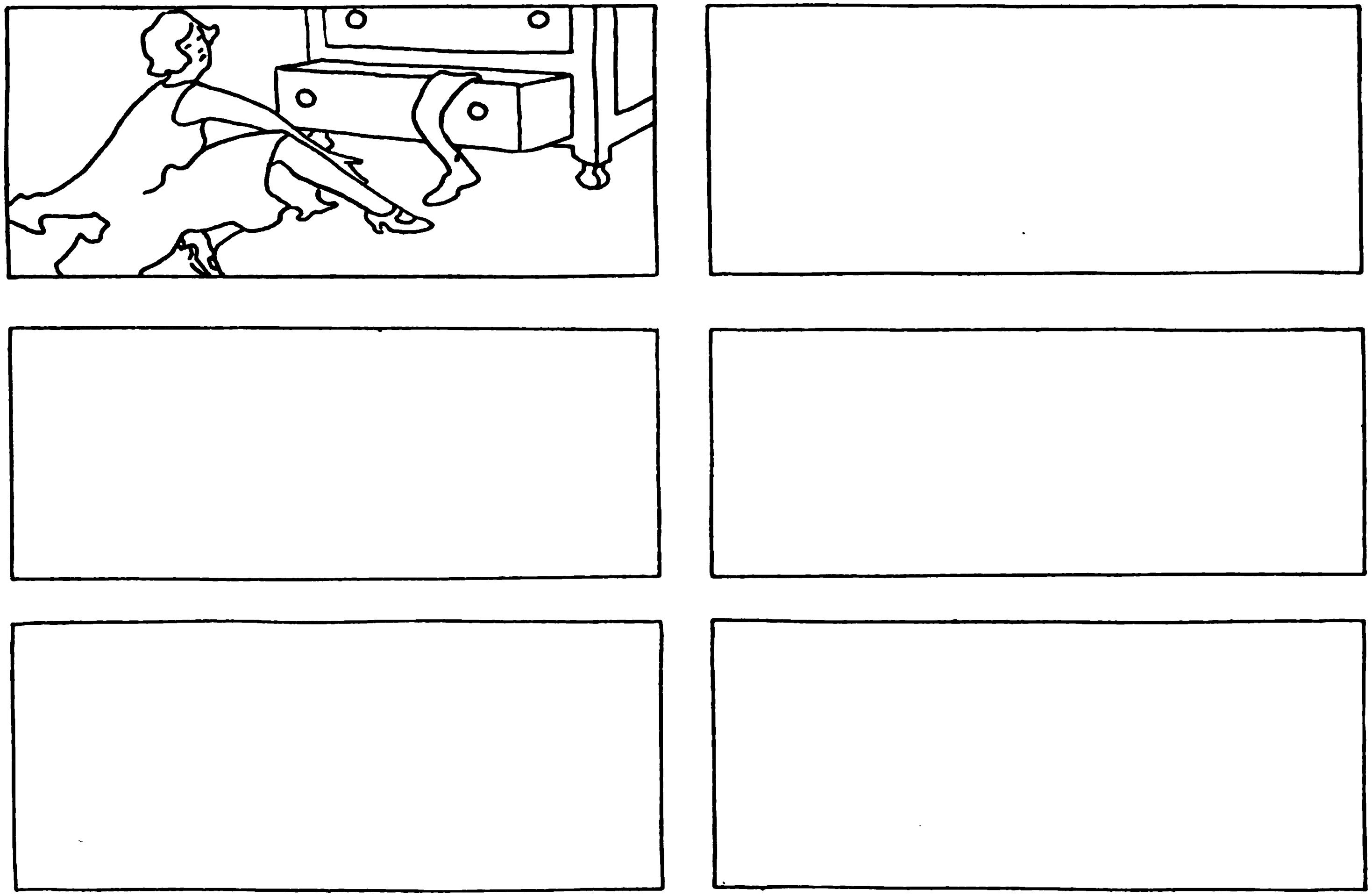

CHART 44

Two Colors and One Mutual Complementary

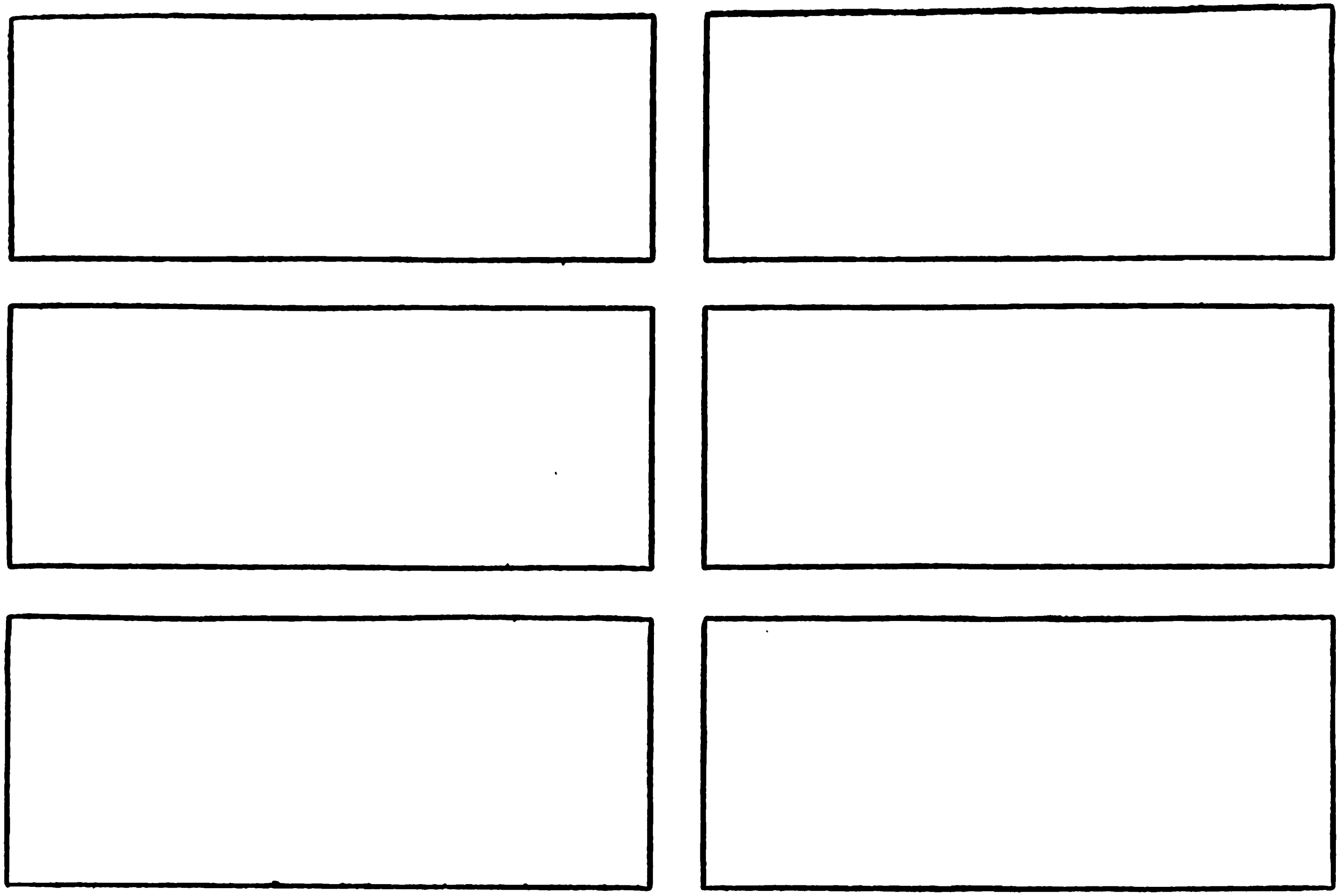

CHART 45

Two Colors and One Mutual Complementary

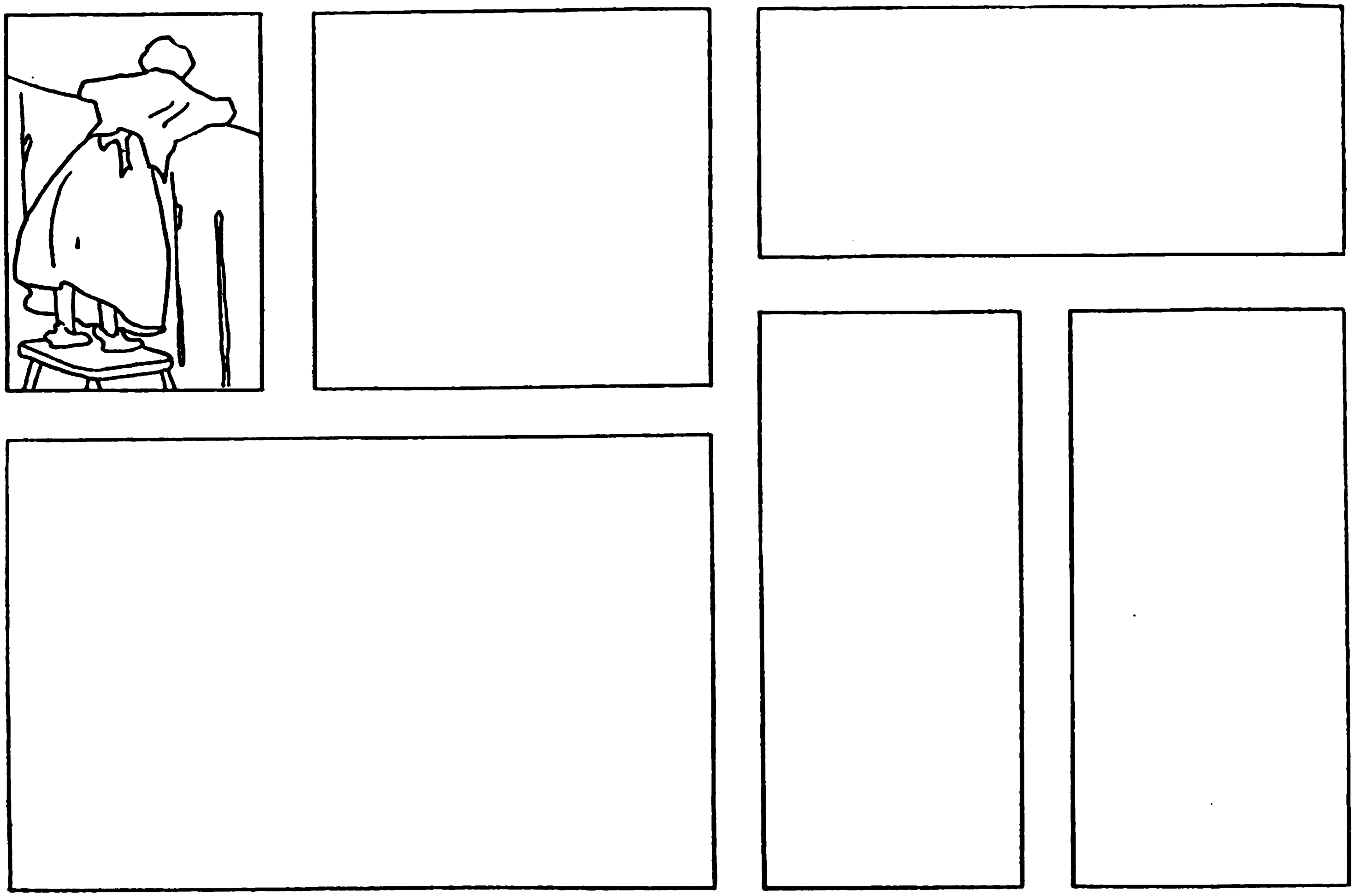

CHART 46

Three Colors and One Mutual Complementary

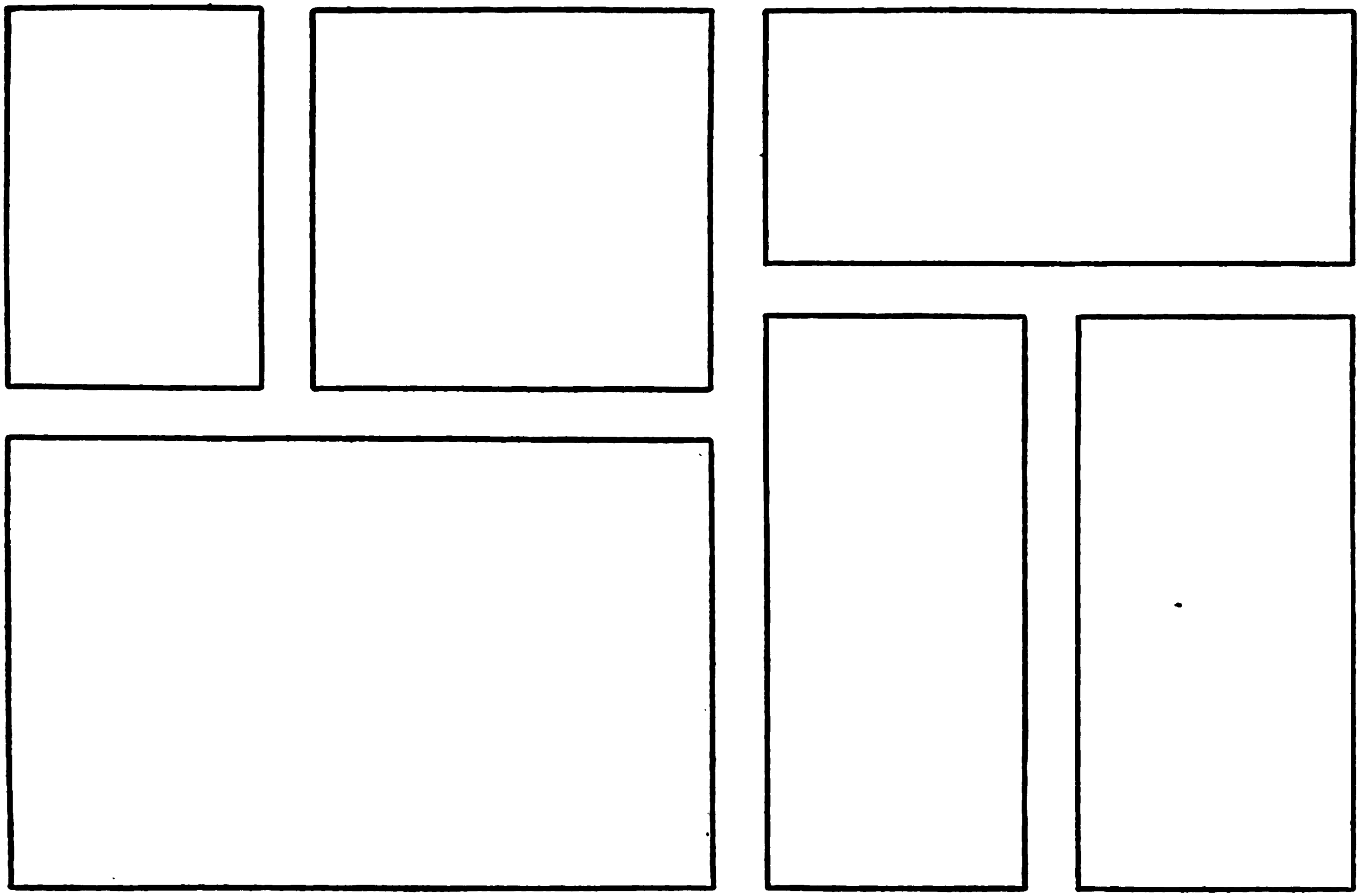

CHART 47

Three Colors and One Mutual Complementary

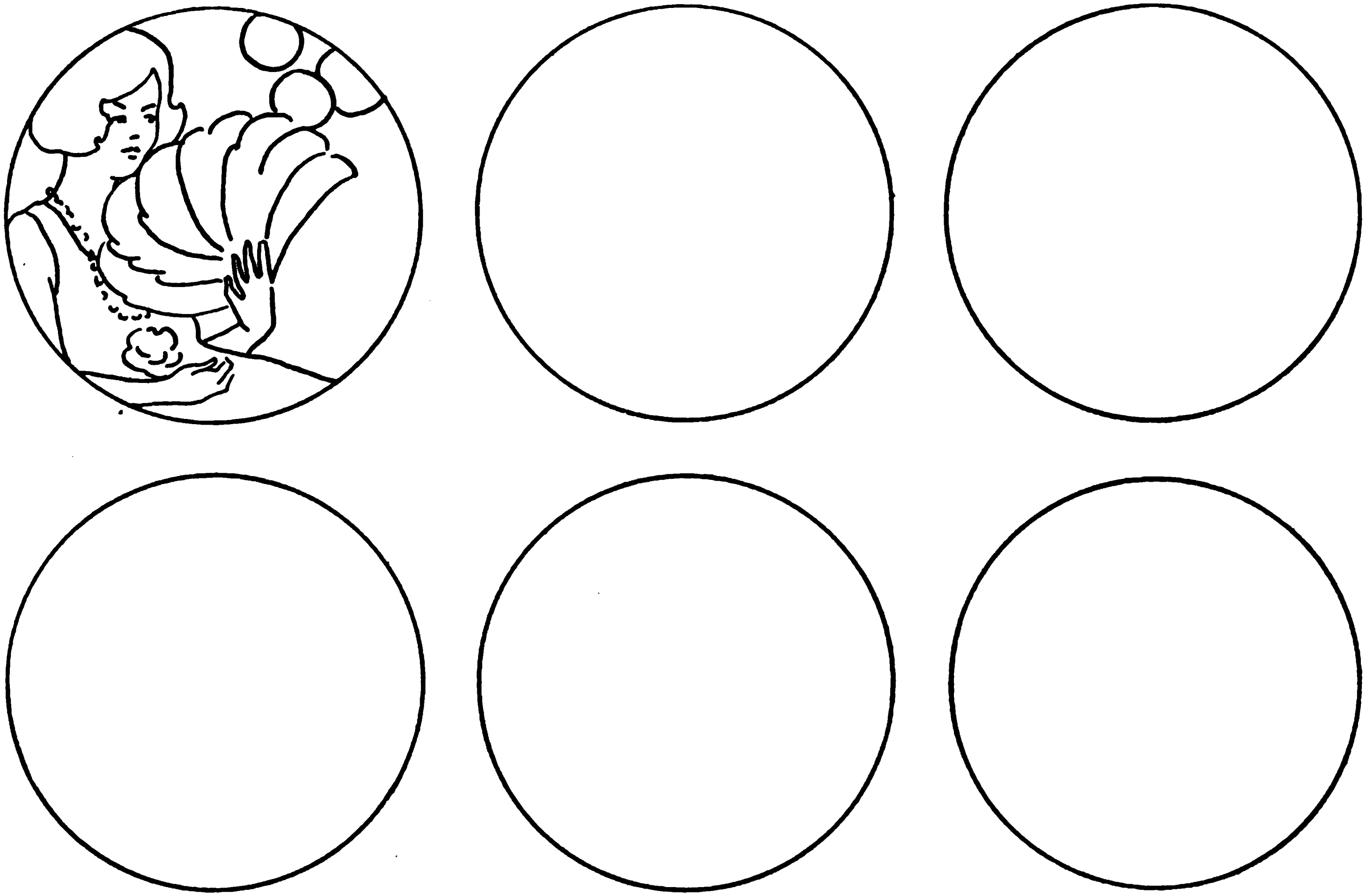

CHART 48

Three Colors and Two Mutual Complementaries

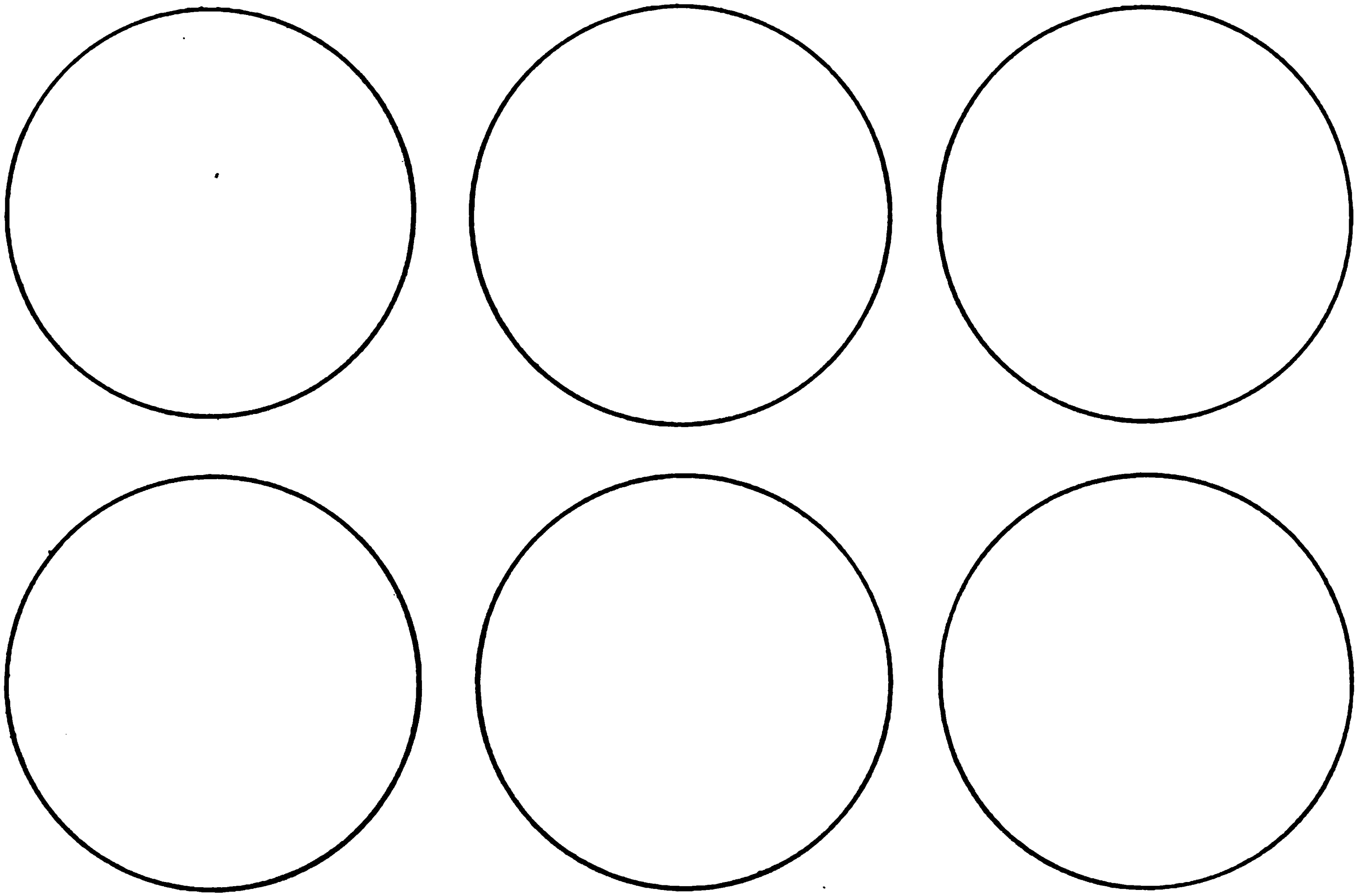

CHART 49

THREE COLORS AND TWO MUTUAL COMPLEMENTARIES

Original from UNIVERSITY OF MICHIGAN

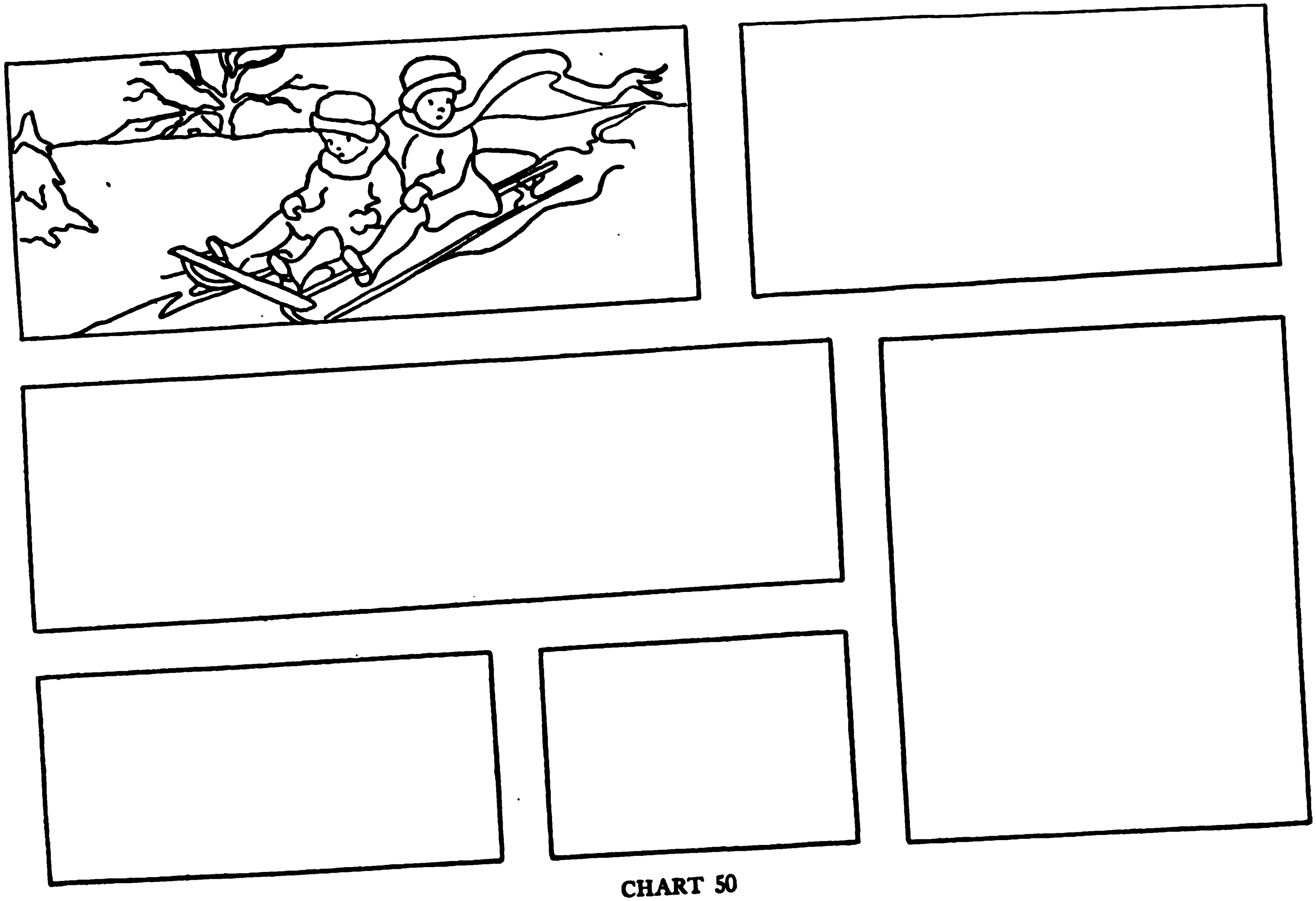

CHART 50

Four Colors and One Mutual Complementary

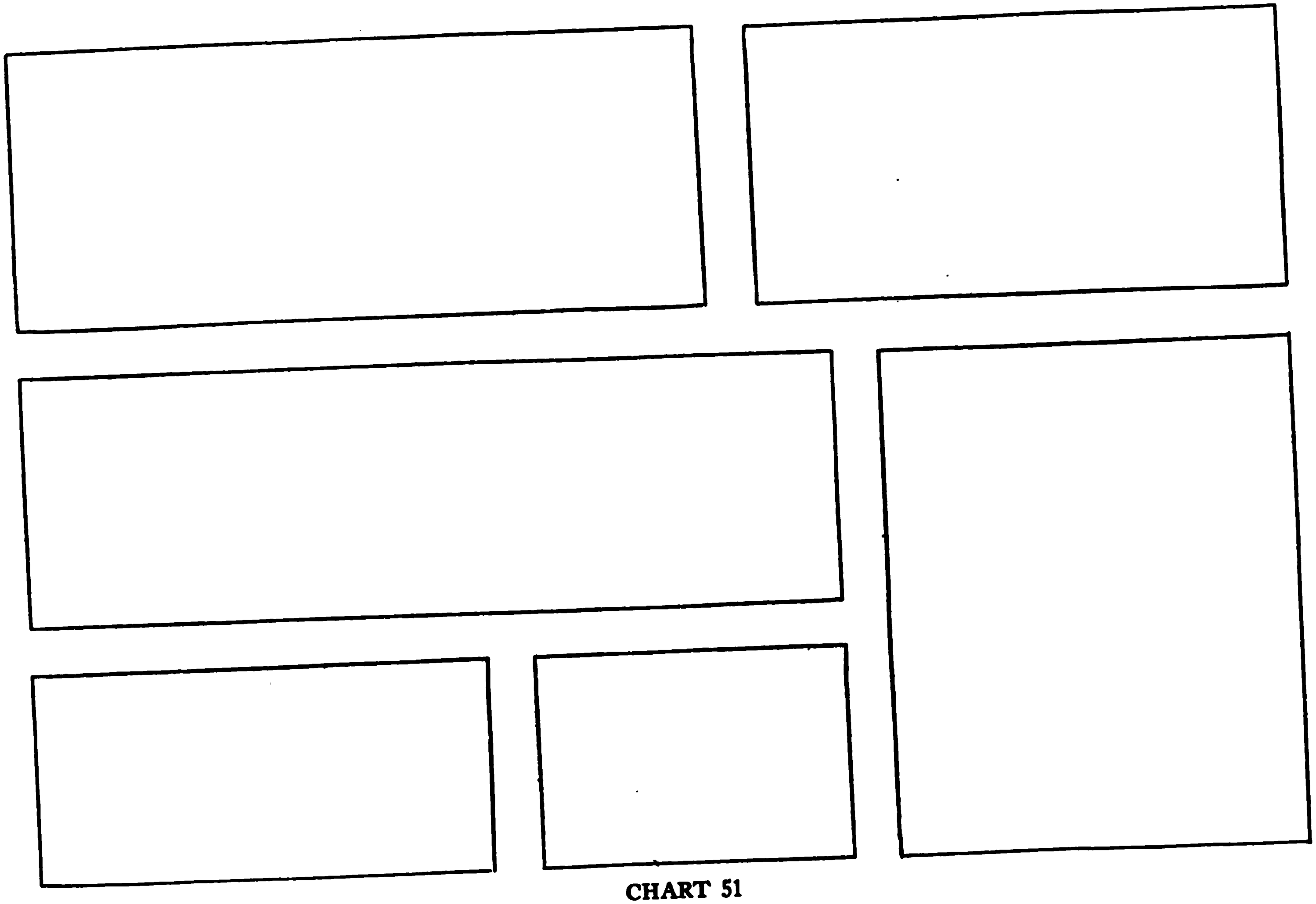

CHART 51

Four Colors and One Mutual Complementary

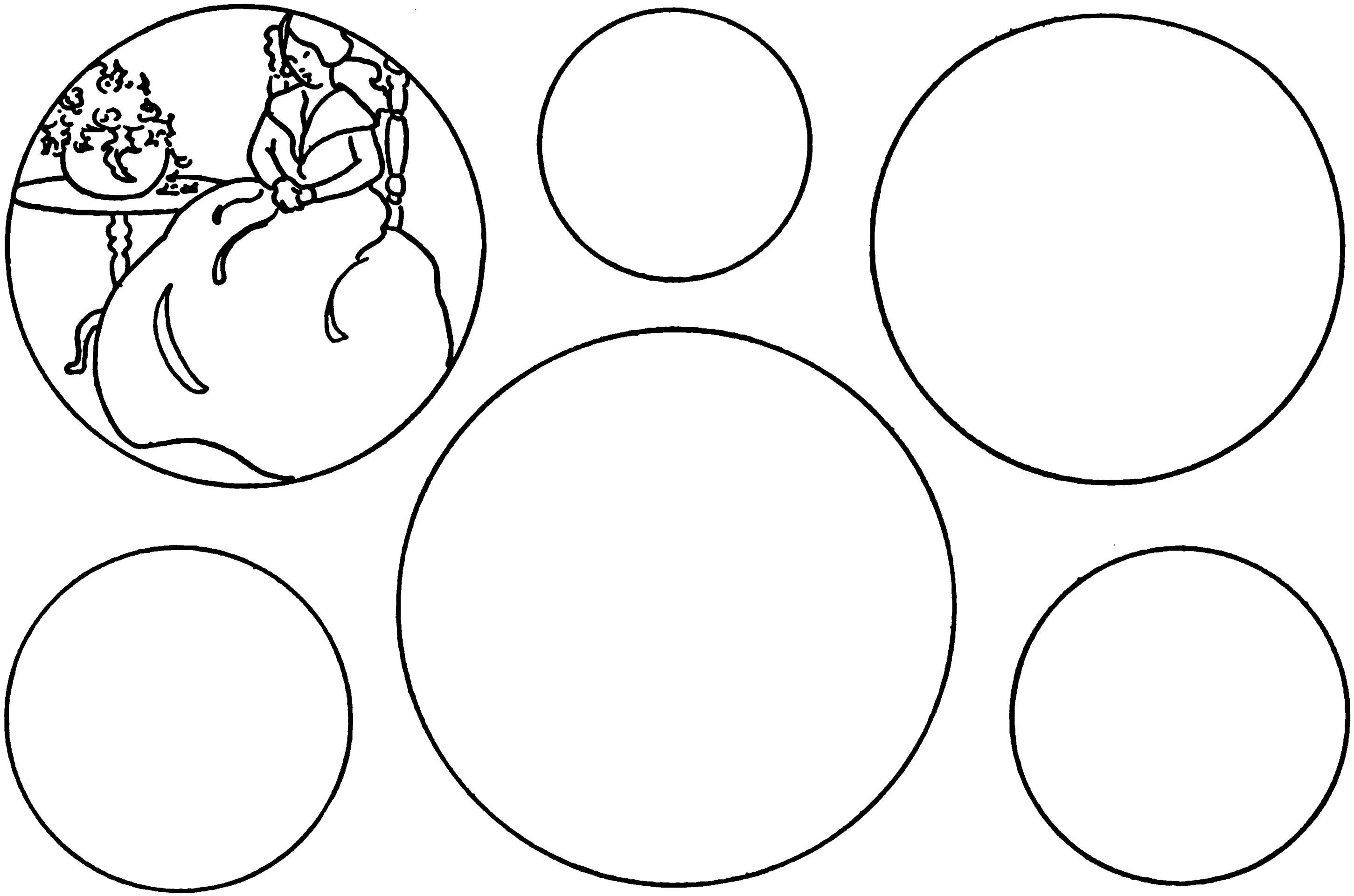

CHART 52

FOUR COLORS AND TWO MUTUAL COMPLEMENTARIES

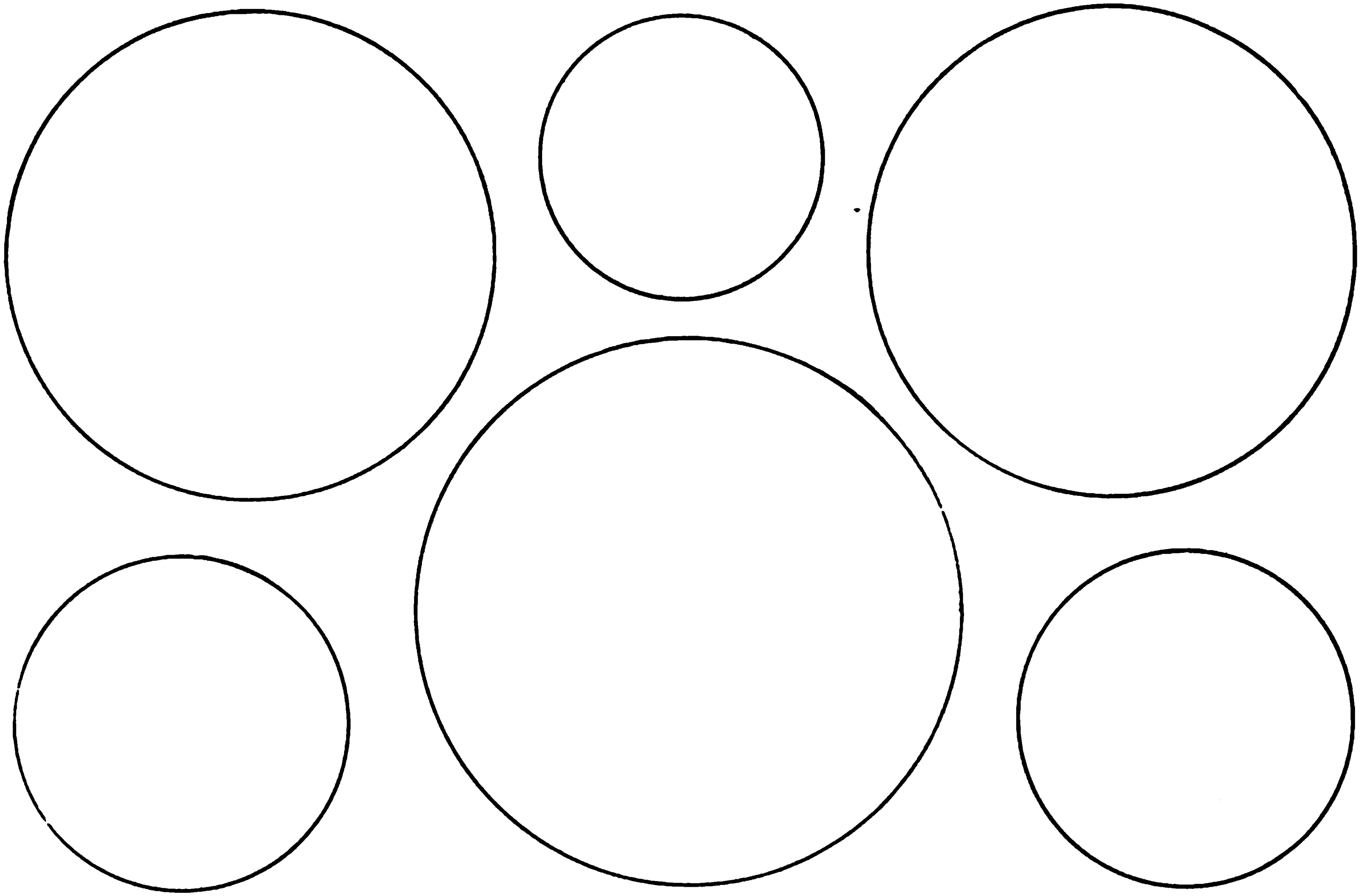

CHART 53

Four Colors and Two Mutual Complementaries

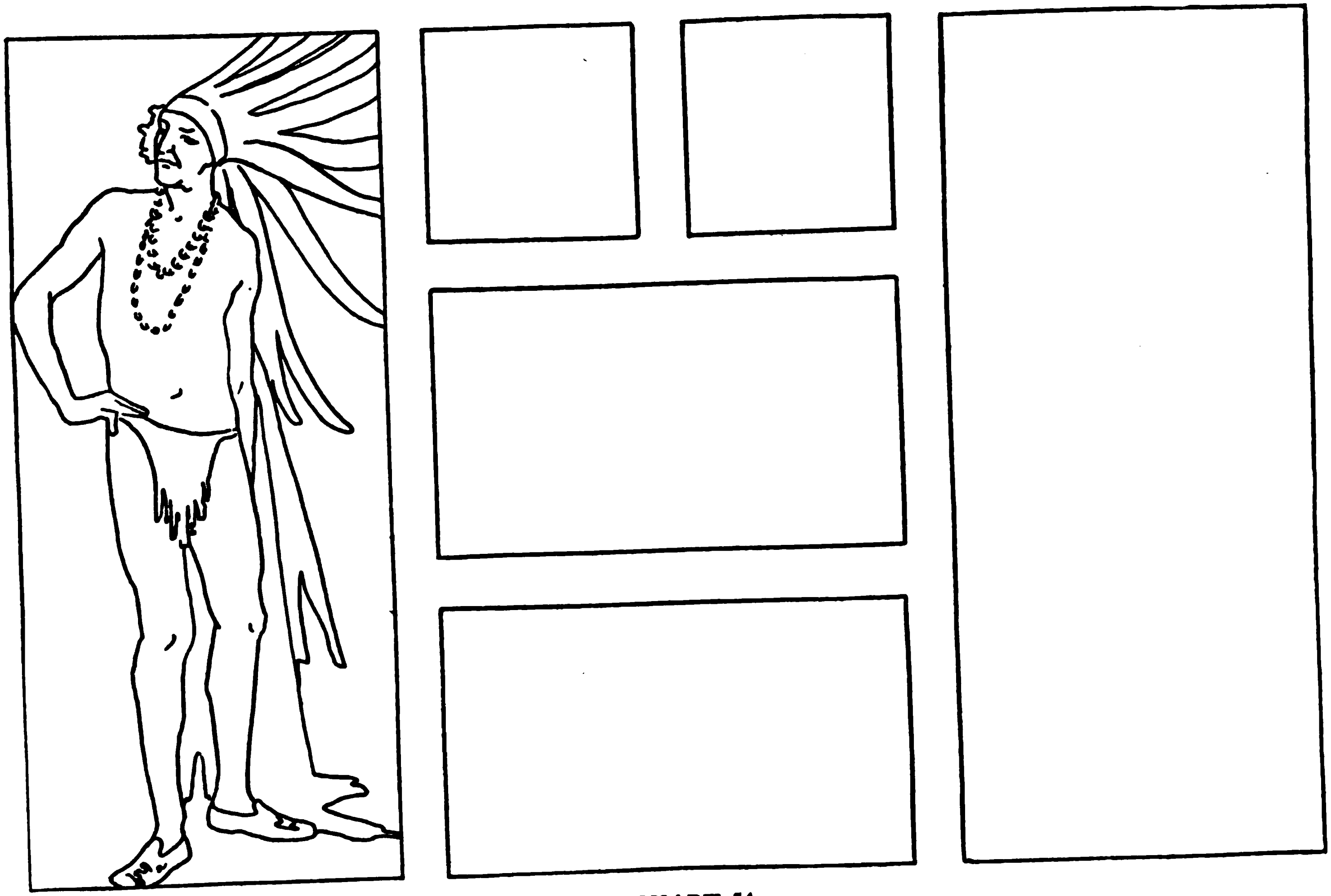

CHART 54

FOUR COLORS AND THREE MUTUAL COMPLEMENTARIES

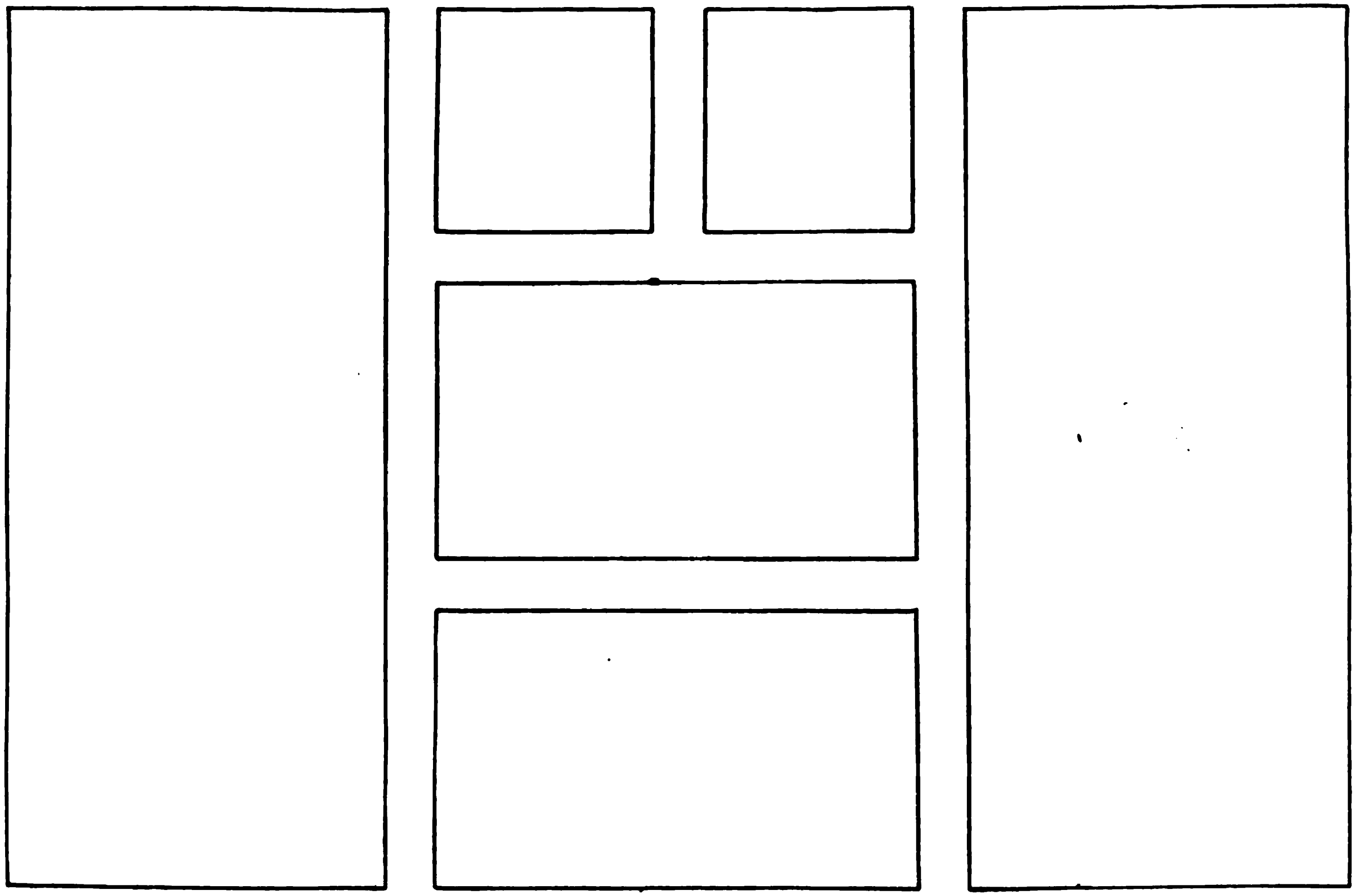

**CHART 55**

Four Colors and Three Mutual Complementaries

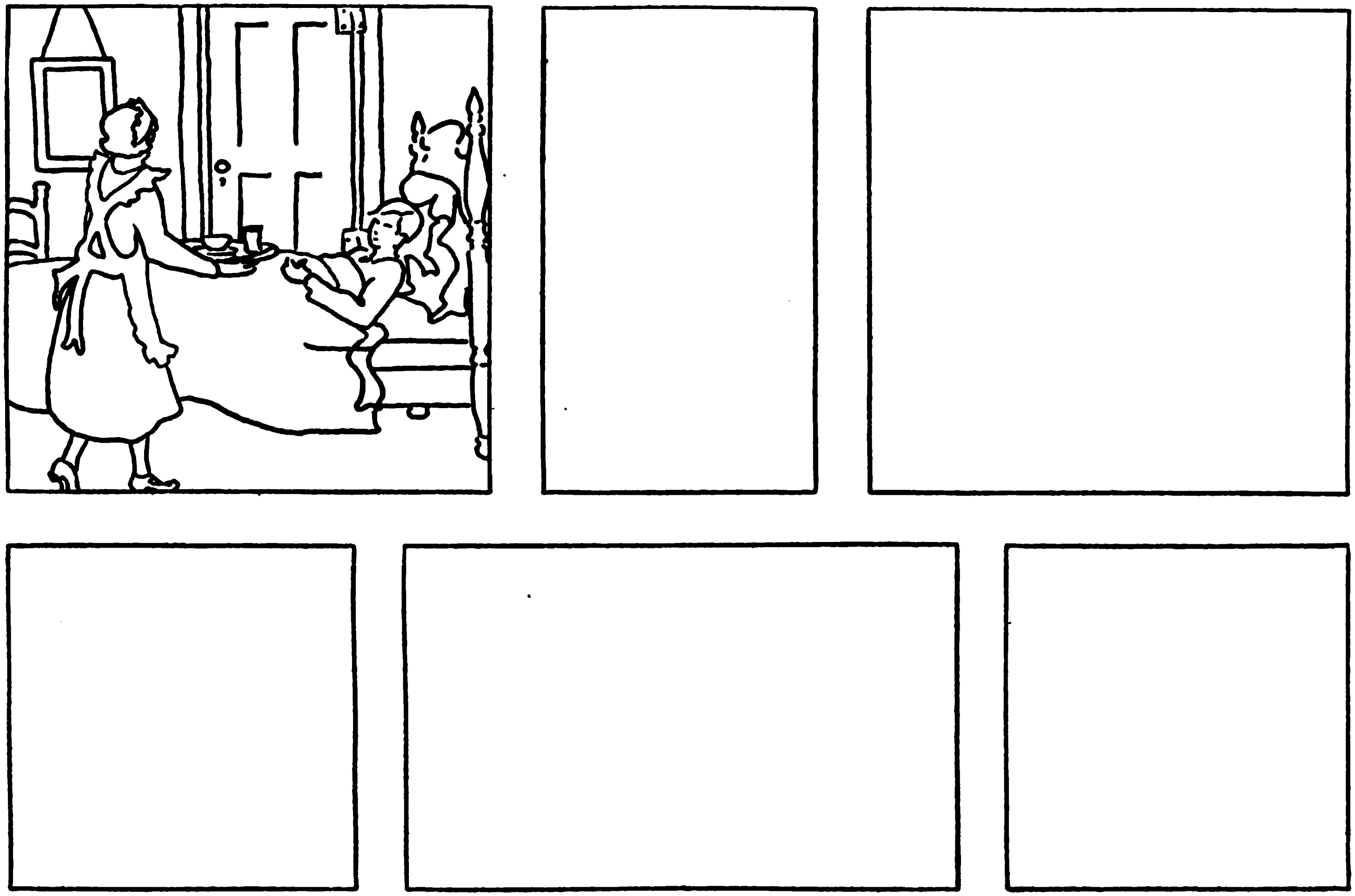

CHART 56

Five Colors and One Mutual Complementary

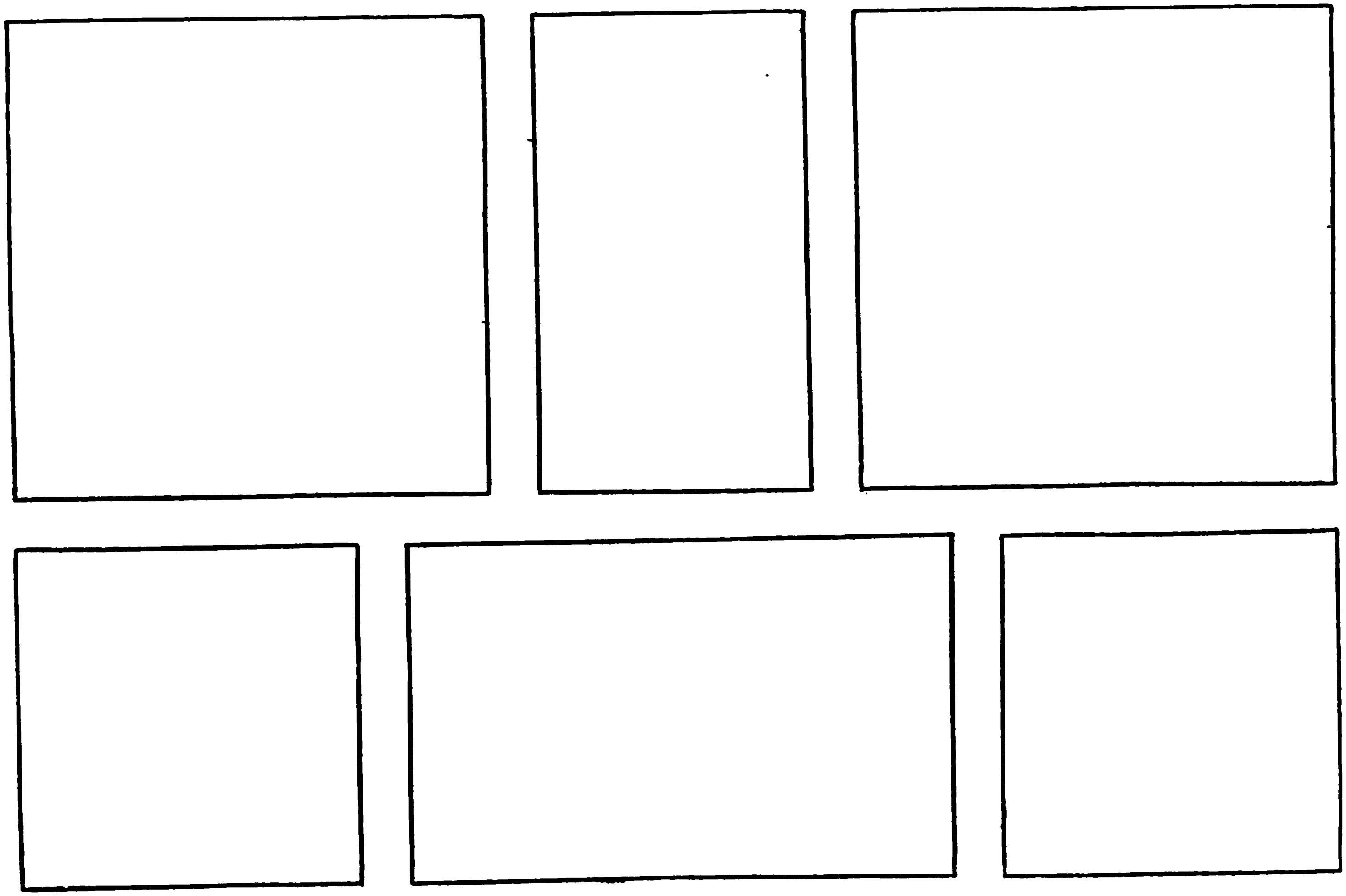

CHART 57

FIVE COLORS AND ONE MUTUAL COMPLEMENTARY

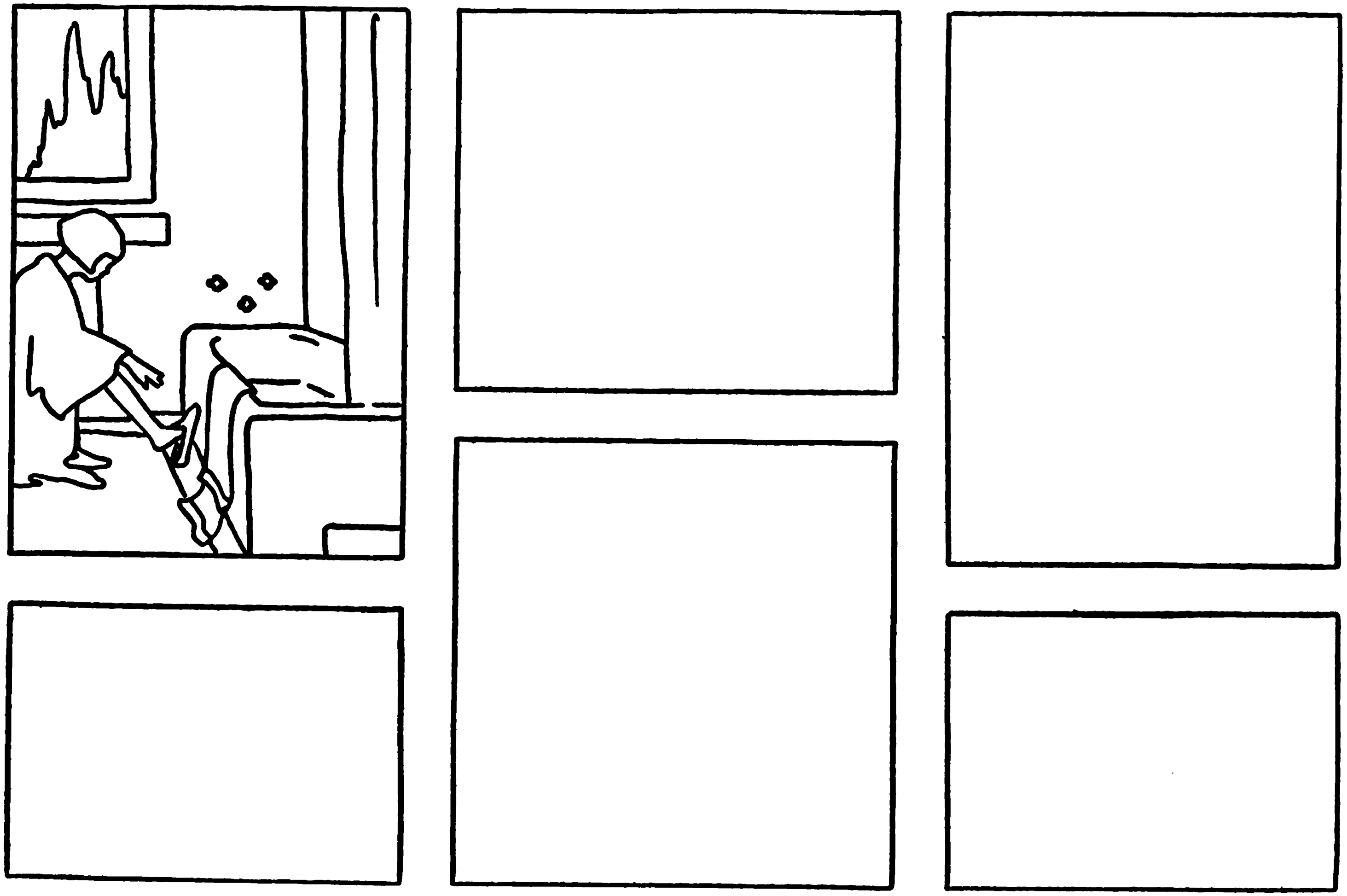

CHART 58

Five Colors and Two Mutual Complementaries

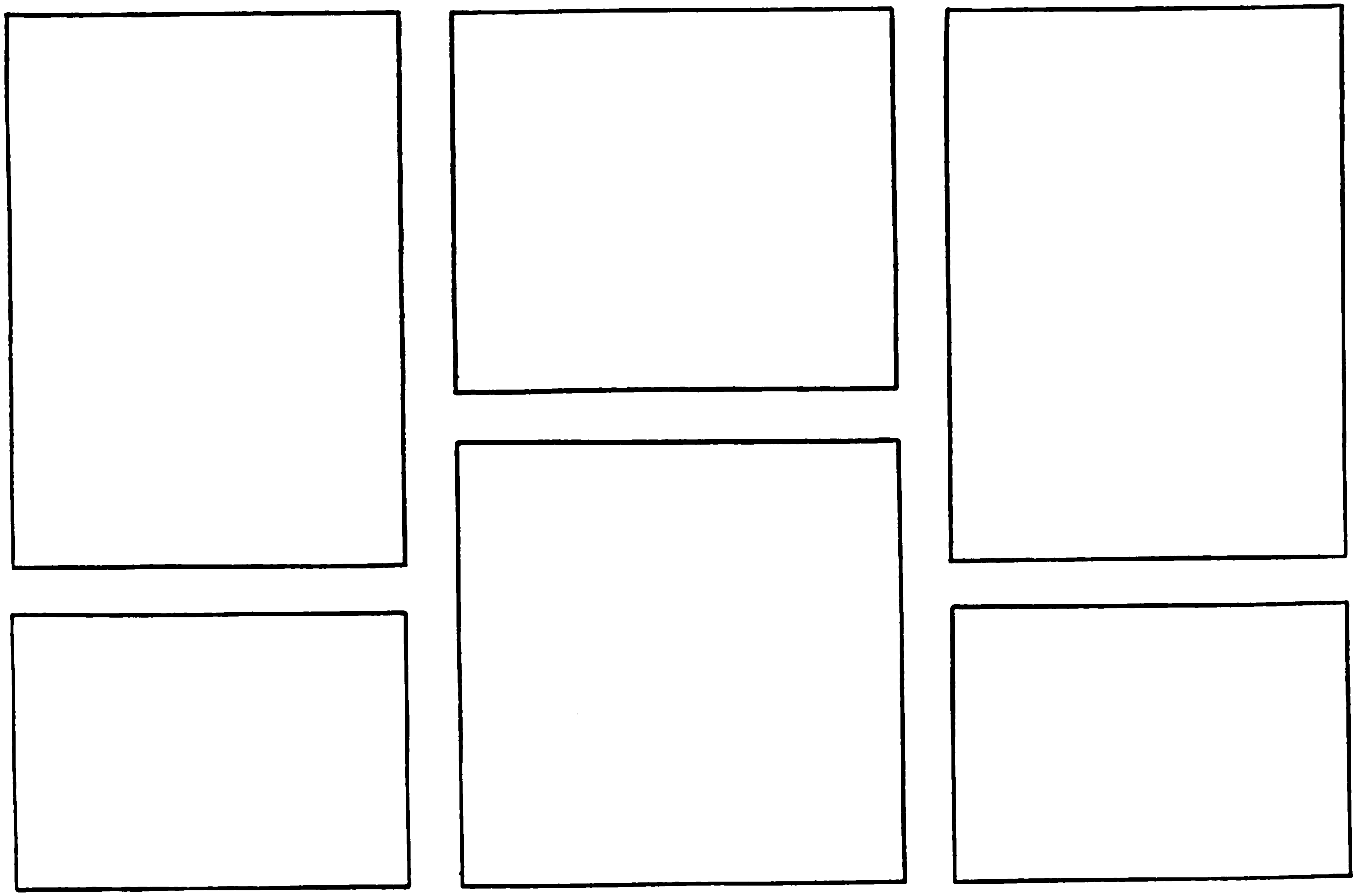

**CHART 59**

Five Colors and Two Mutual Complementaries

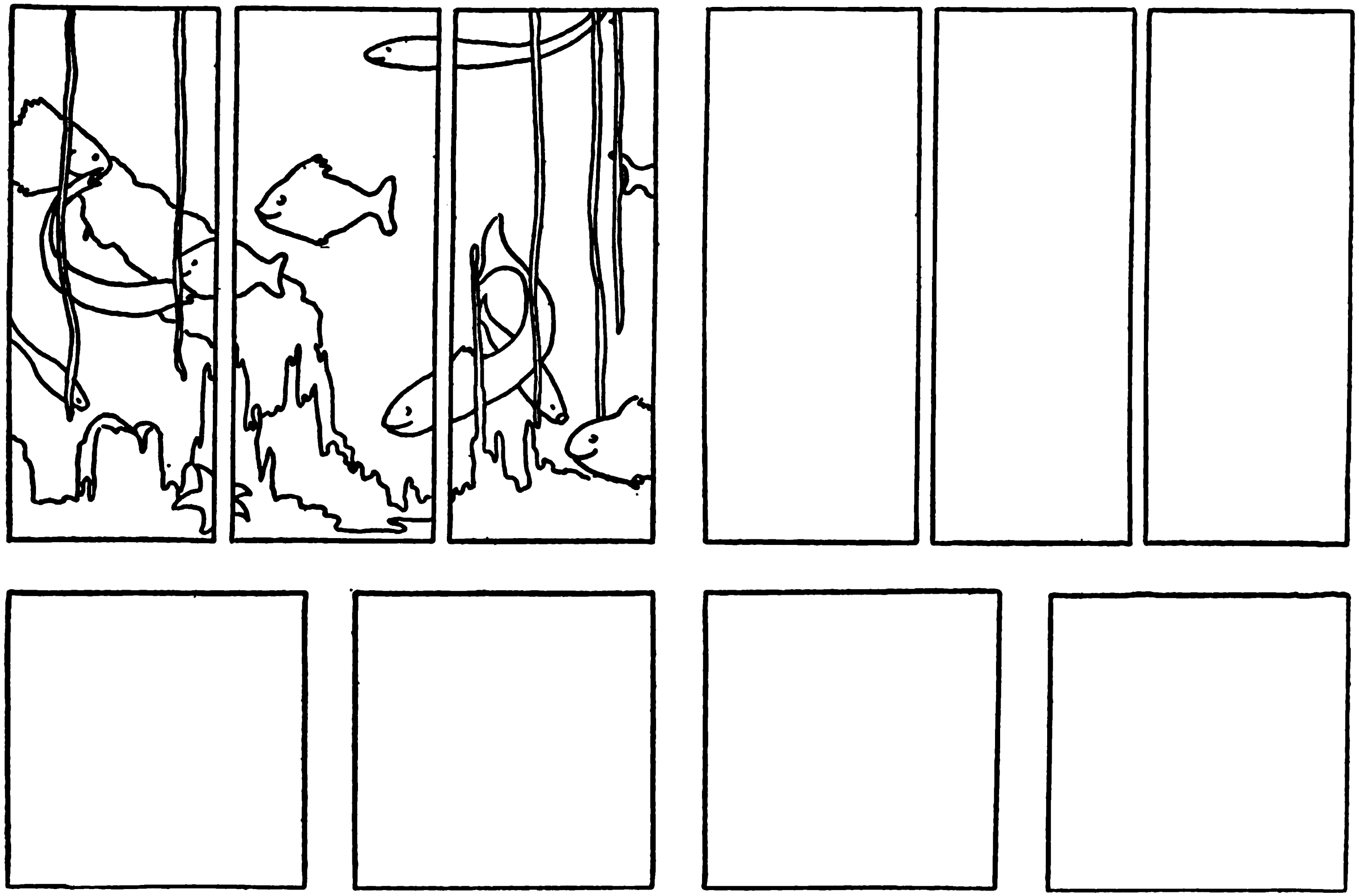

CHART 60

Five Colors and Three Mutual Complementaries

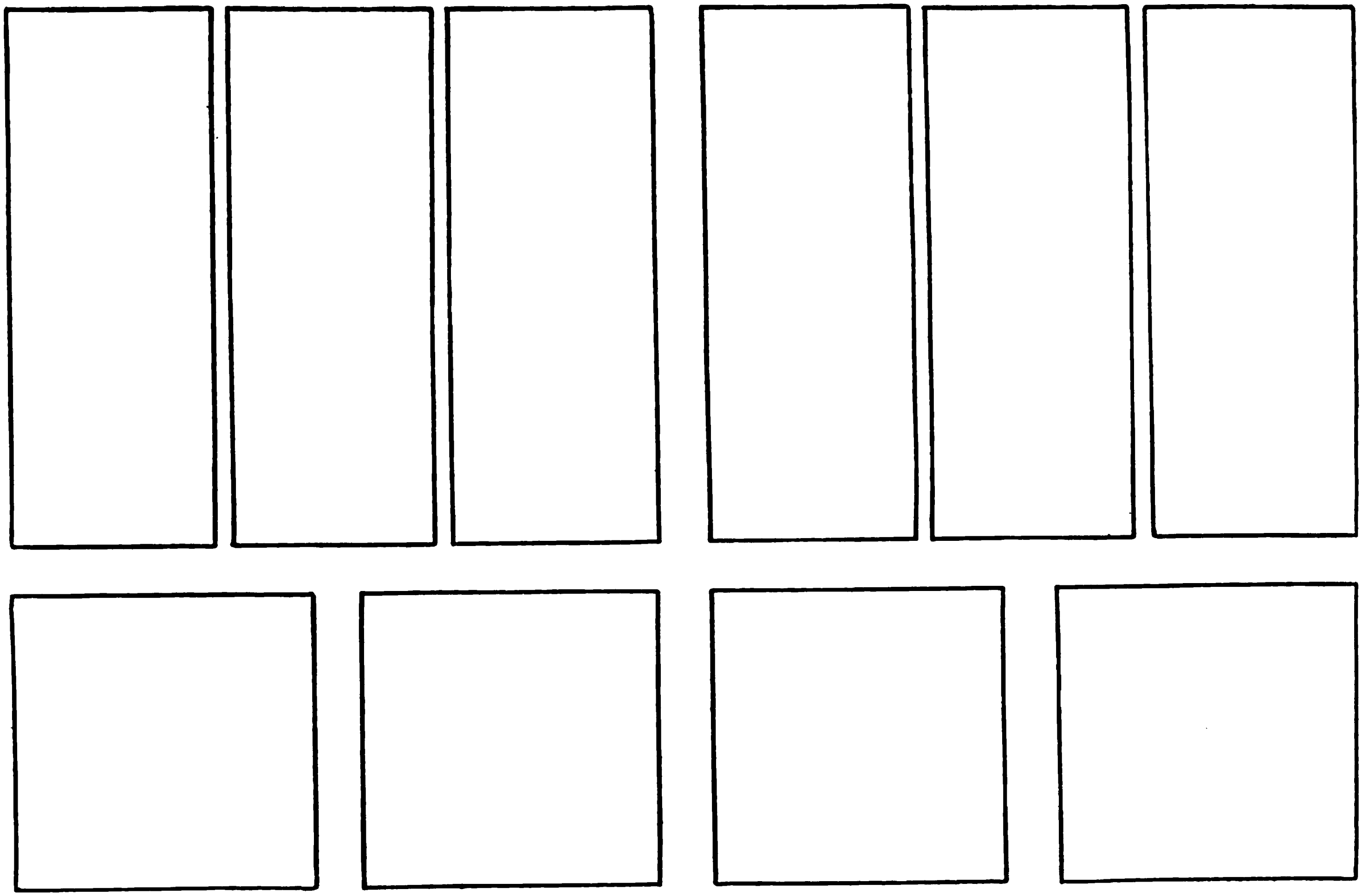

CHART 61

FIVE COLORS AND THREE MUTUAL COMPLEMENTARIES

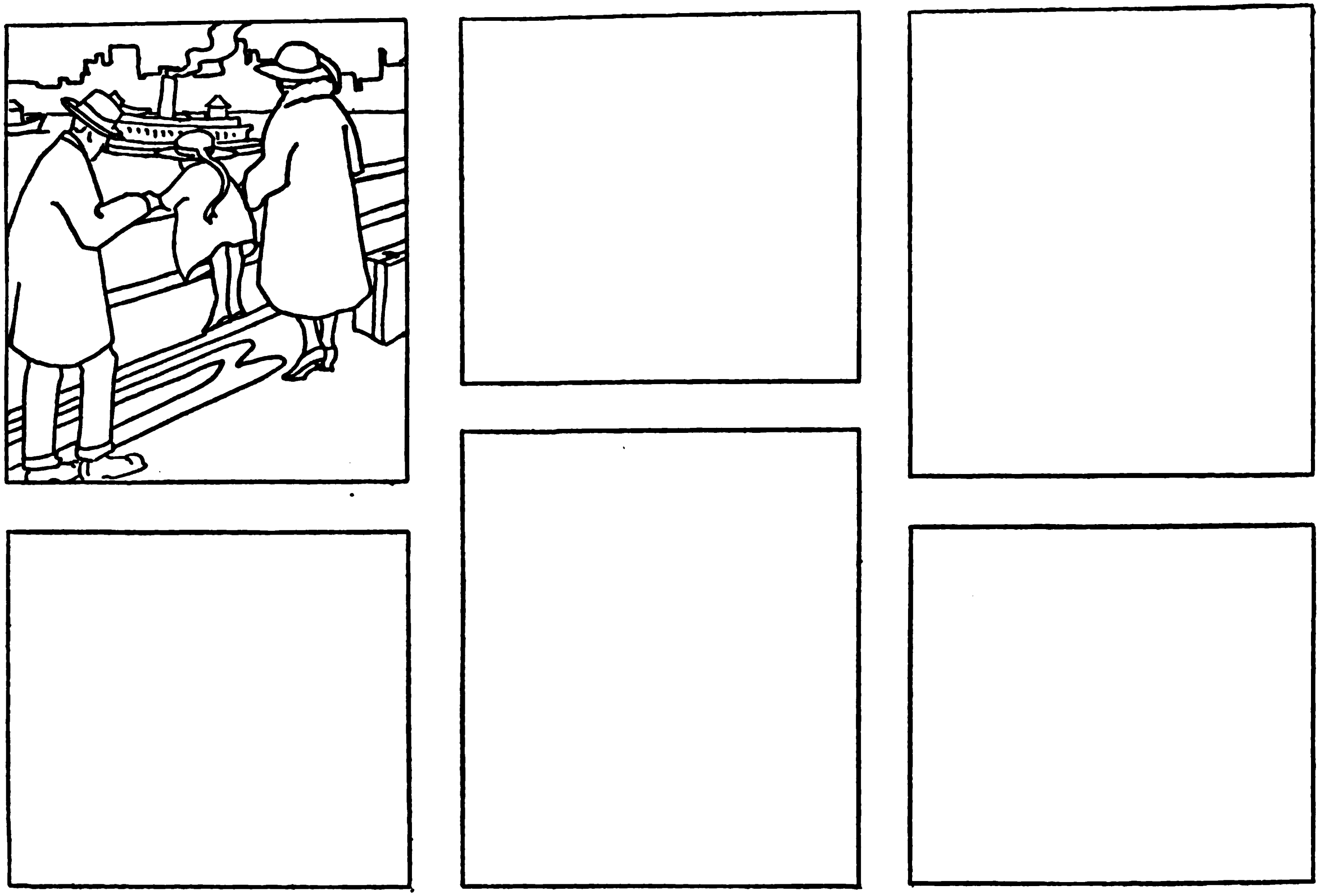

**CHART 62**

**Five Colors and Four Mutual Complementaries**

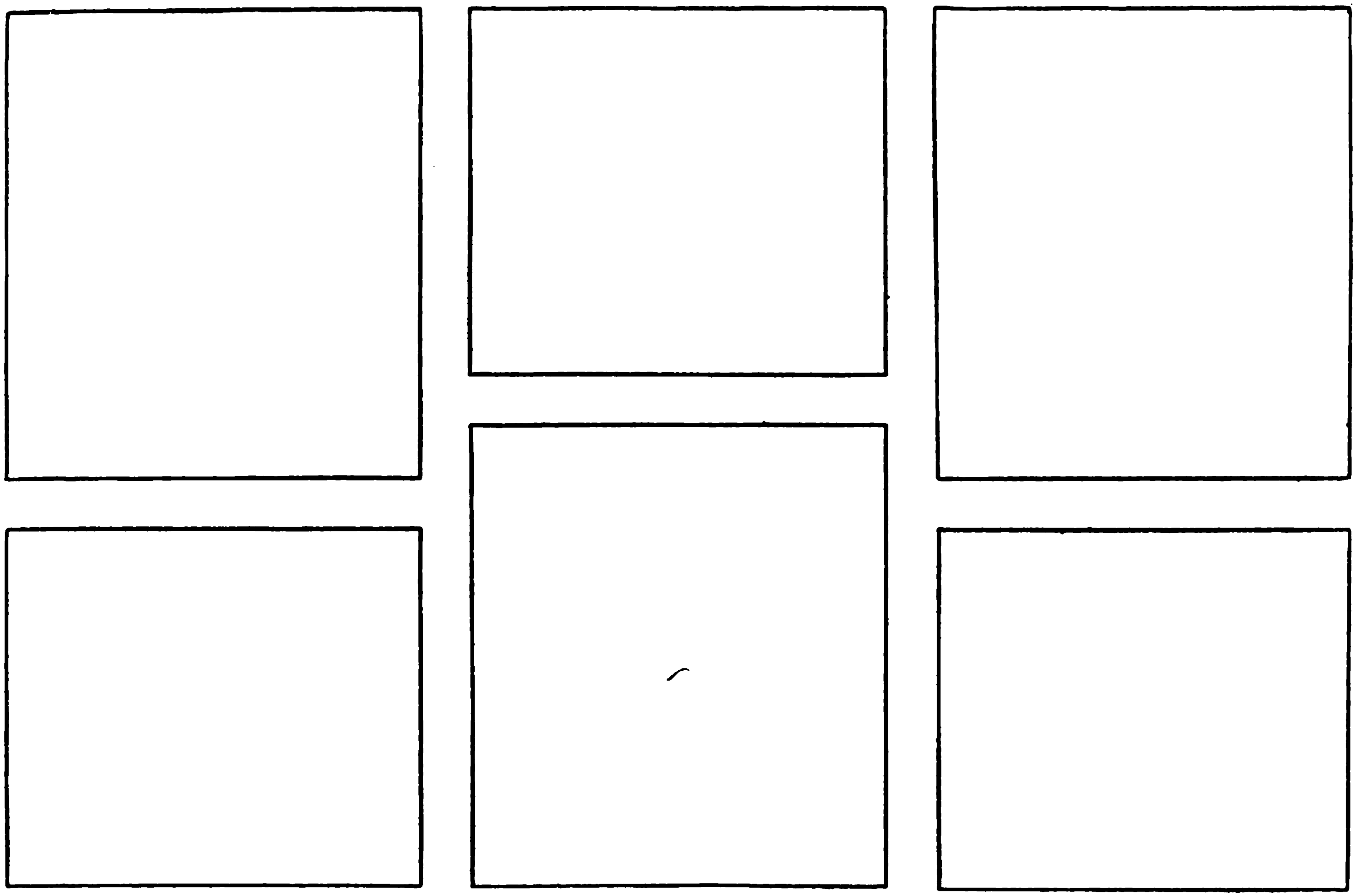

**CHART 63**

Five Colors and Four Mutual Complementaries

CHART 64

SIX COLORS AND ONE MUTUAL COMPLEMENTARY

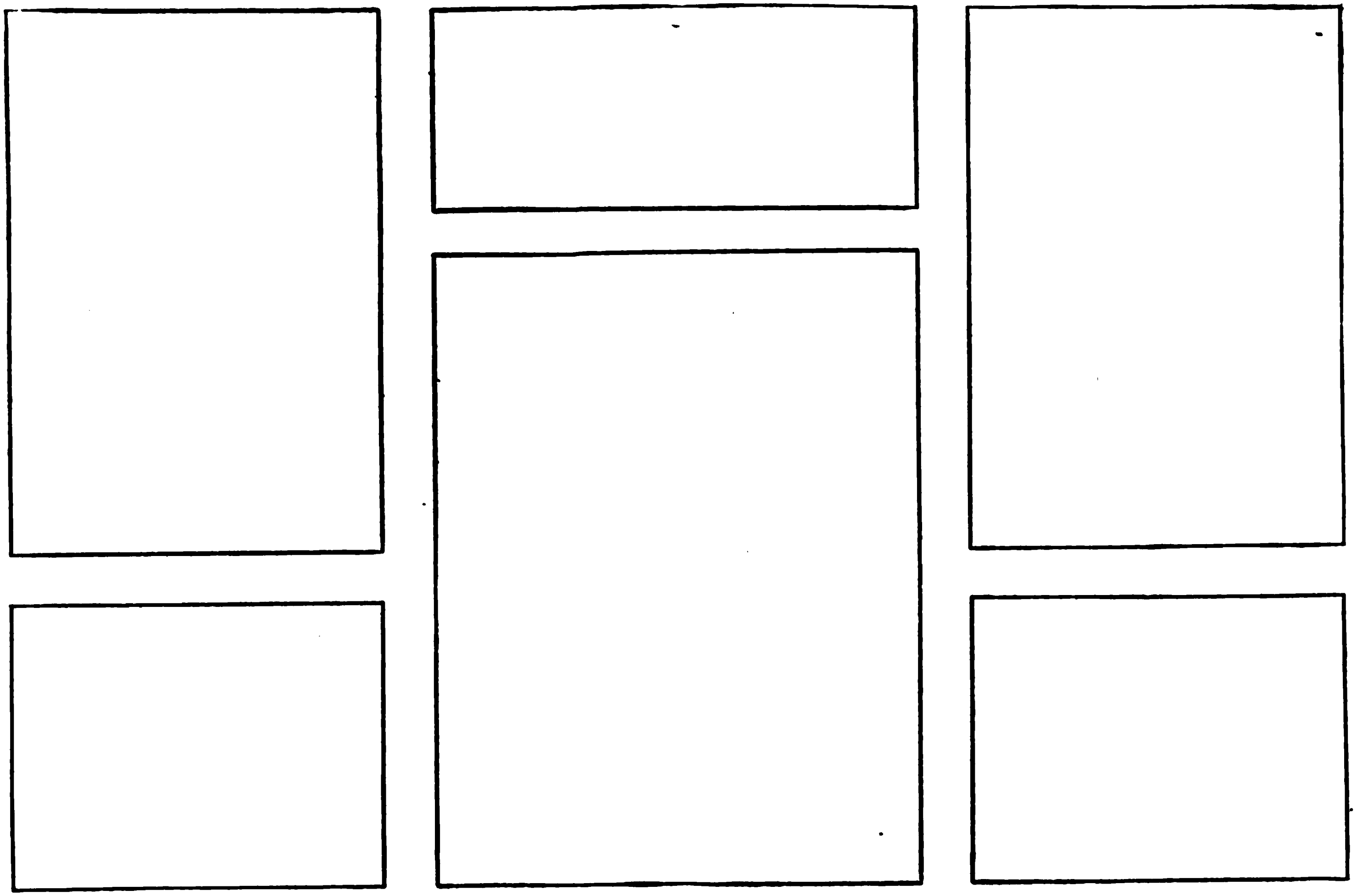

CHART 65

Six Colors and One Mutual Complementary

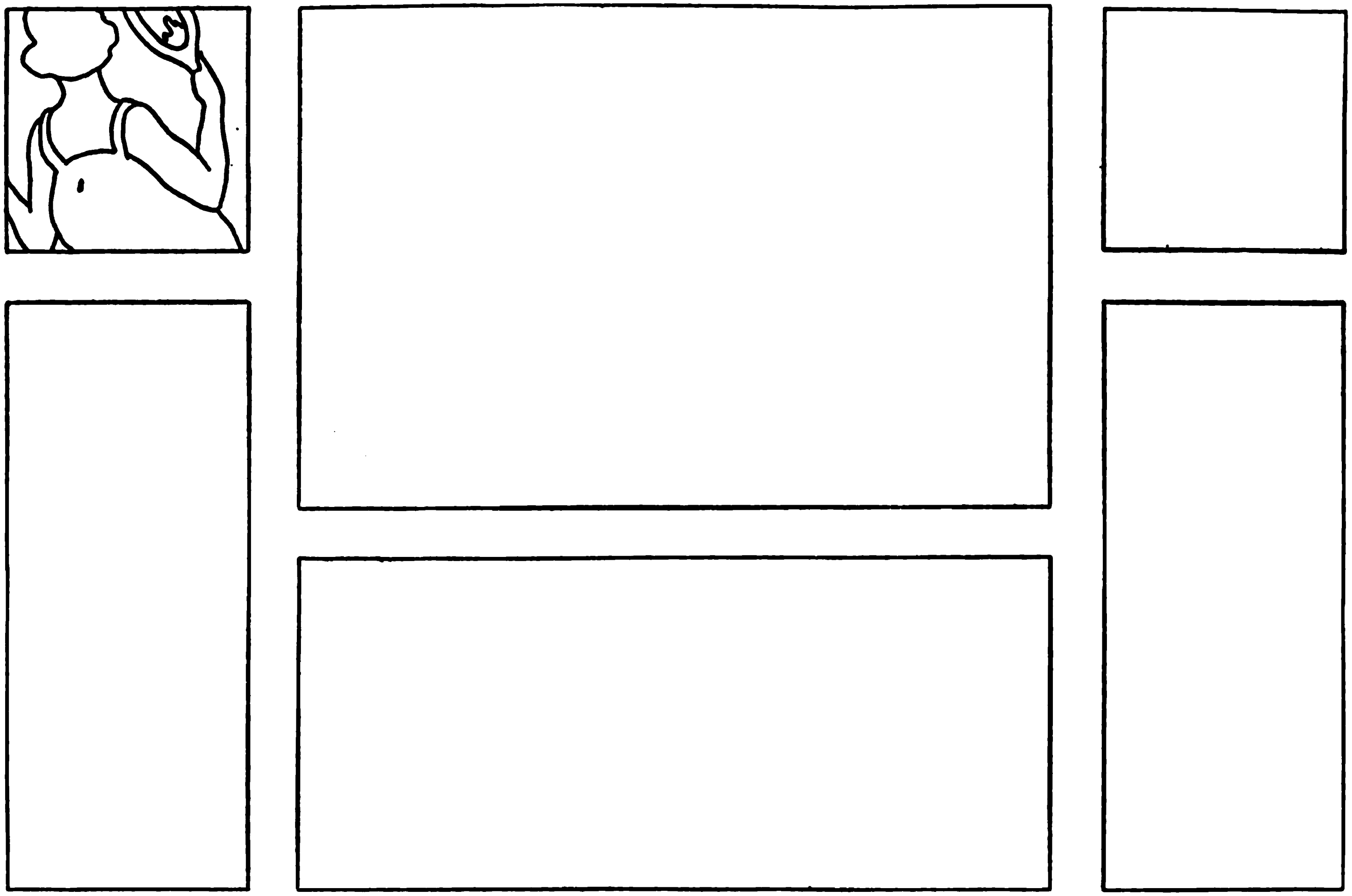

CHART 66

Six Colors and Two Mutual Complementaries

Original from UNIVERSITY OF MICHIGAN

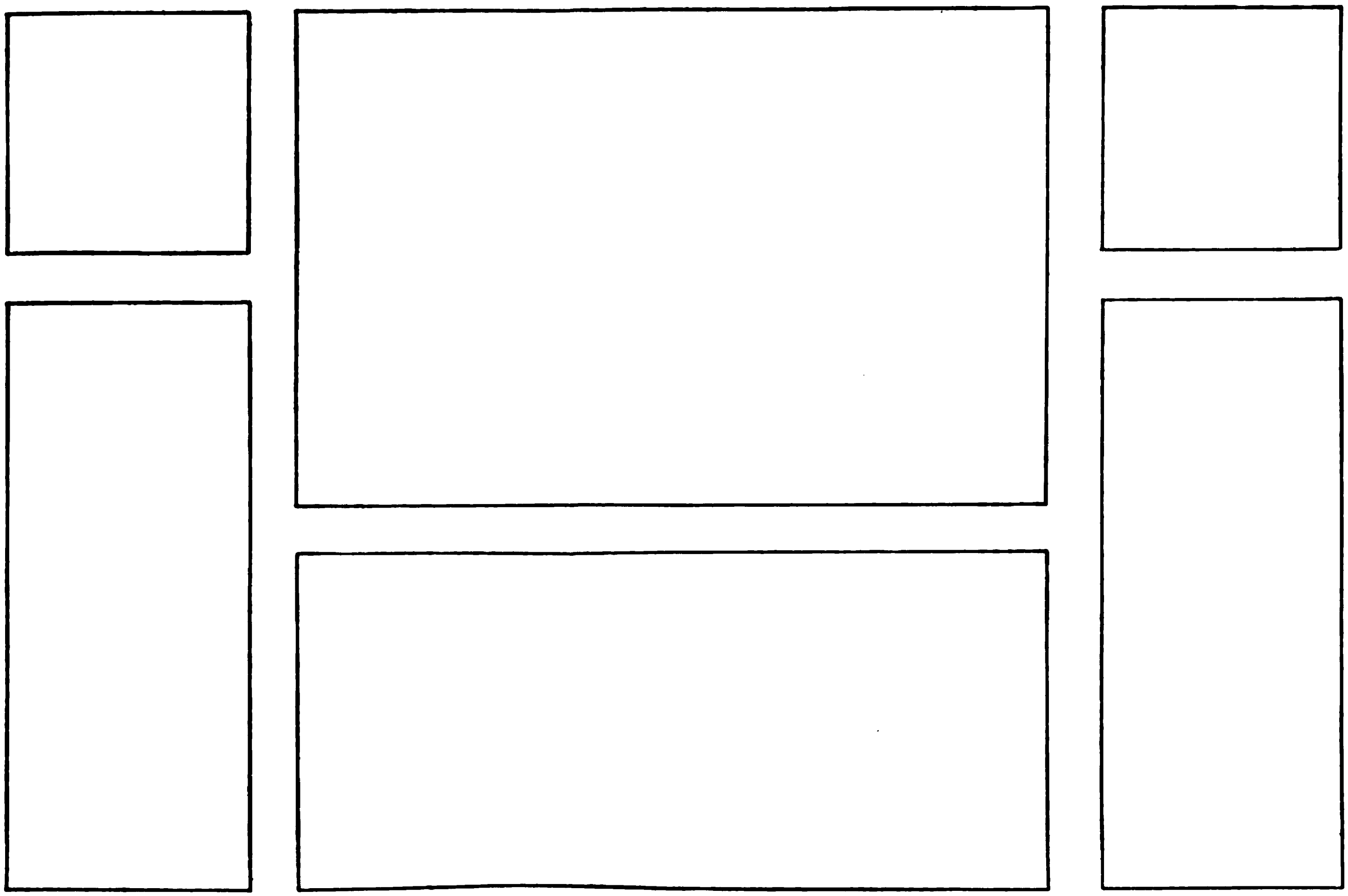

CHART 67

SIX COLORS AND TWO MUTUAL COMPLEMENTARIES

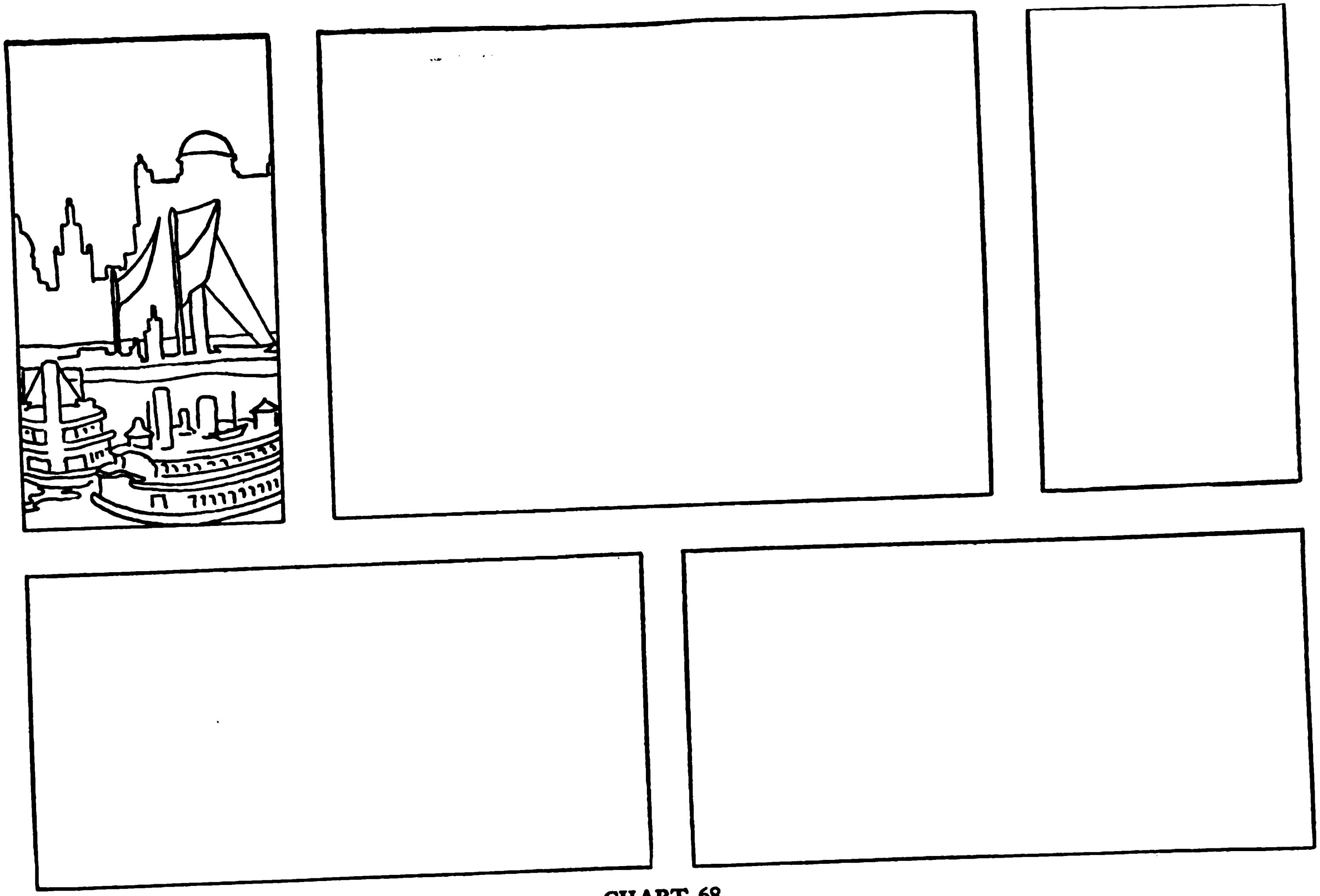

CHART 68

SIX COLORS AND THREE MUTUAL COMPLEMENTARIES

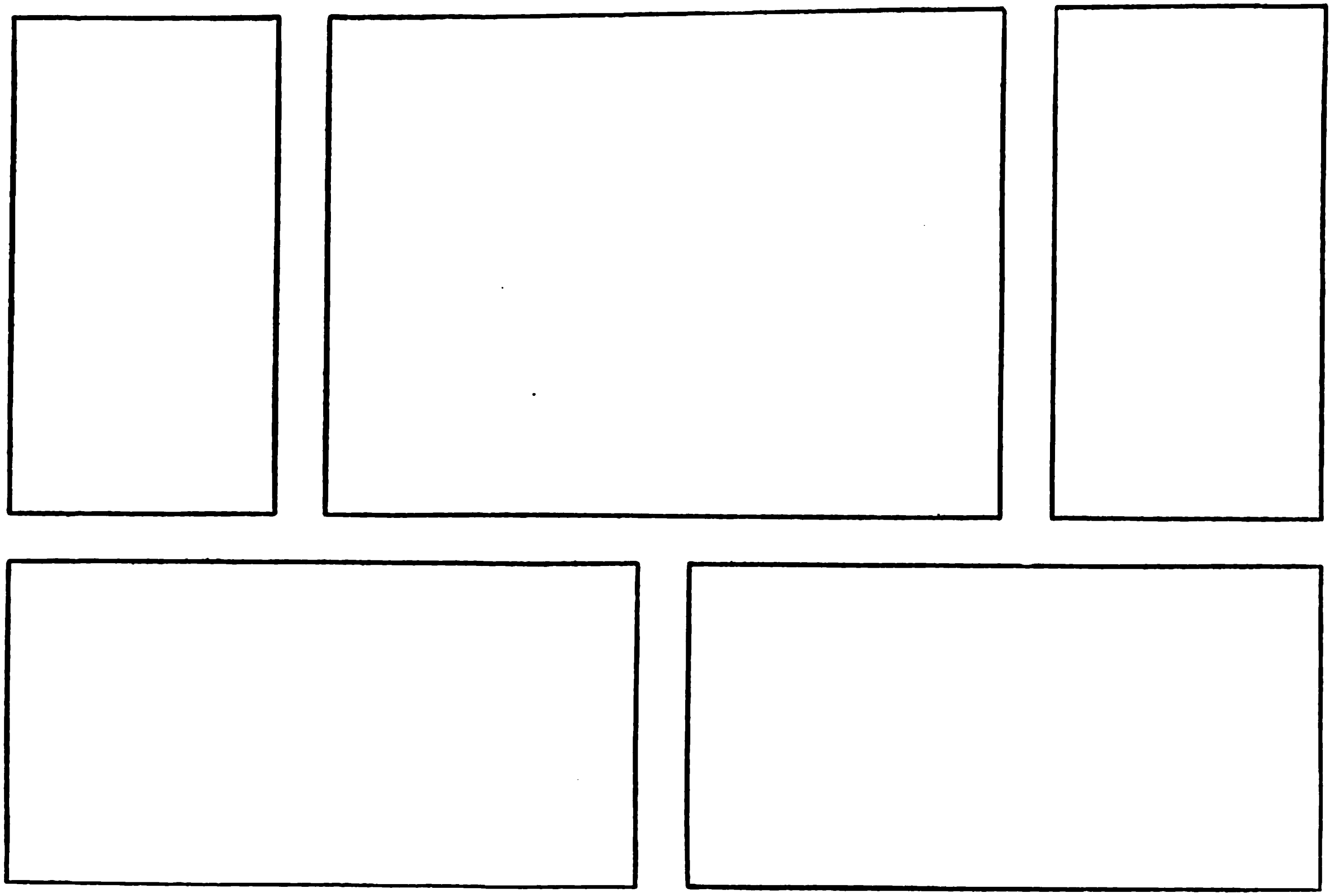

CHART 69

Six Colors and Three Mutual Complementaries

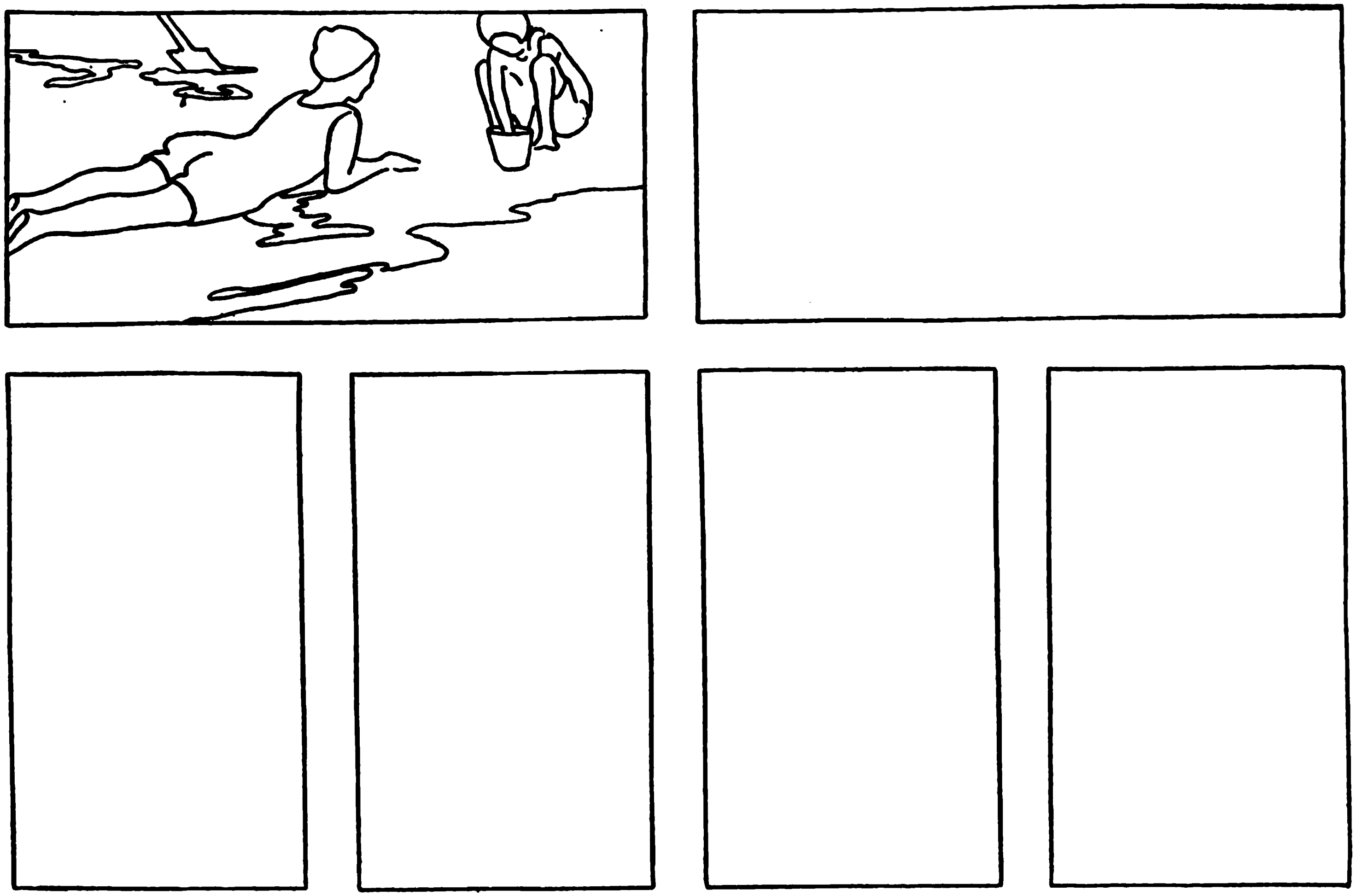

CHART 70

Six Colors and Four Mutual Complementaries

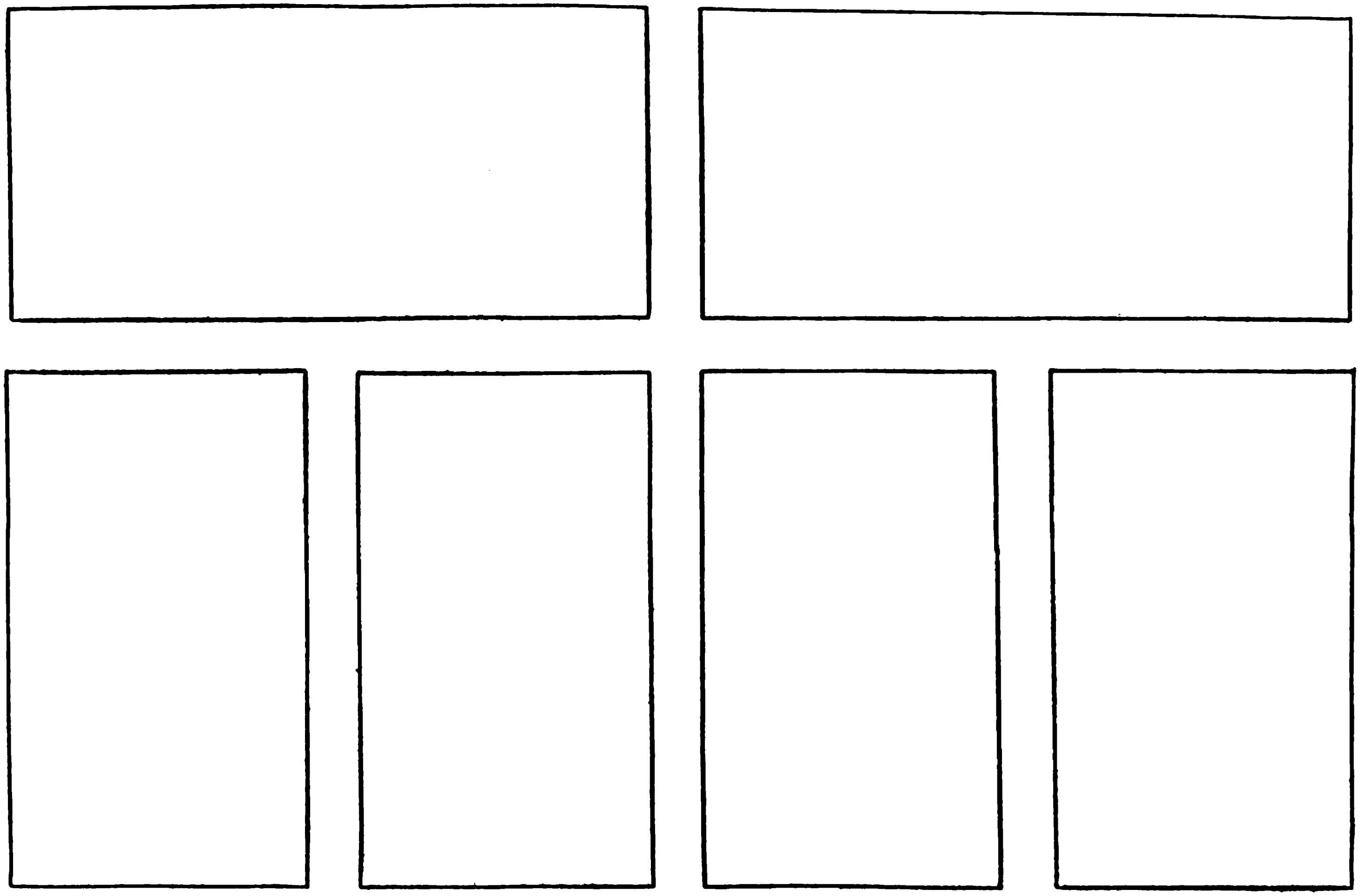

CHART 71

Six Colors and Four Mutual Complementaries

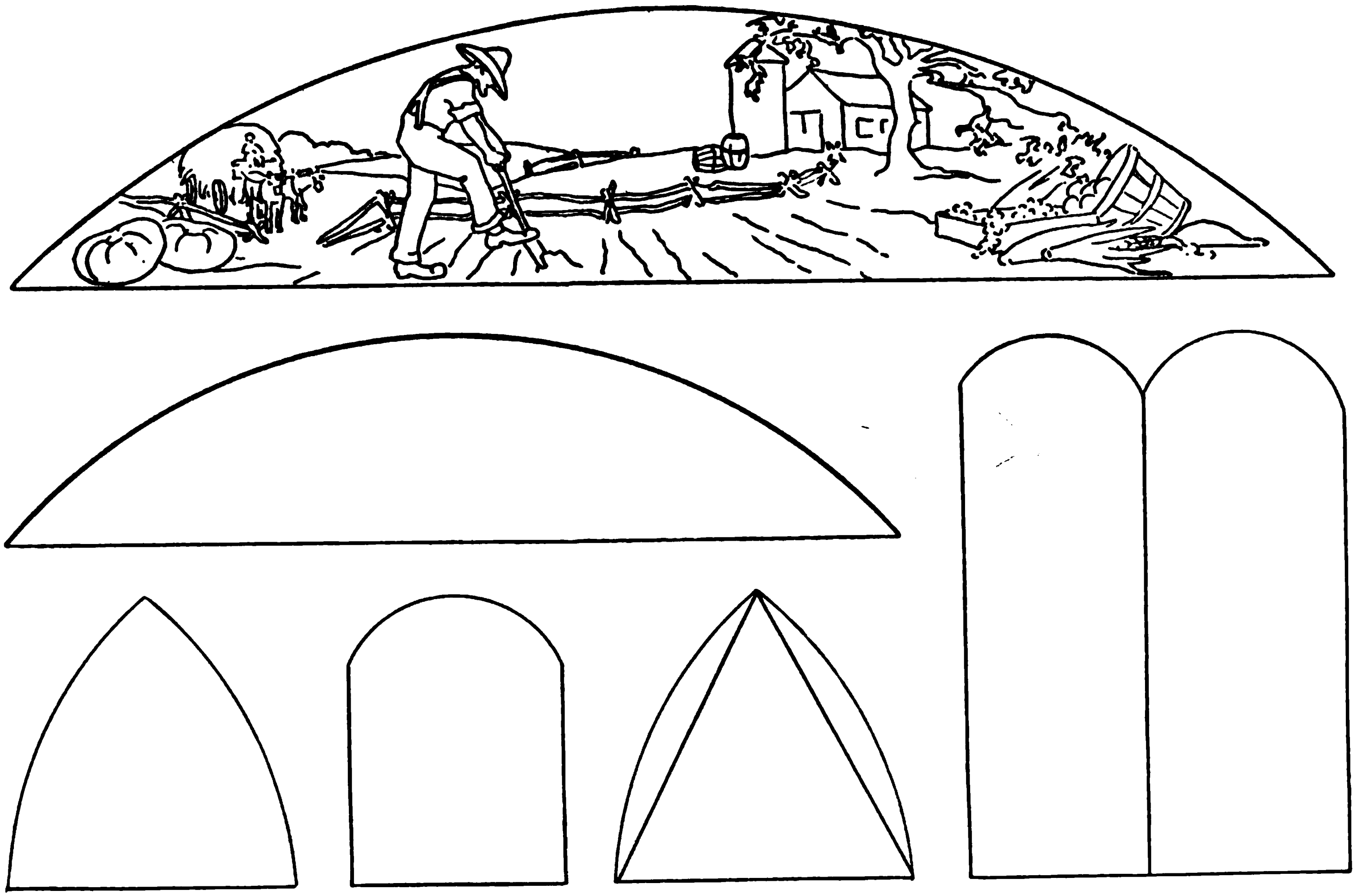

CHART 72

Six Colors and Five Mutual Complementaries

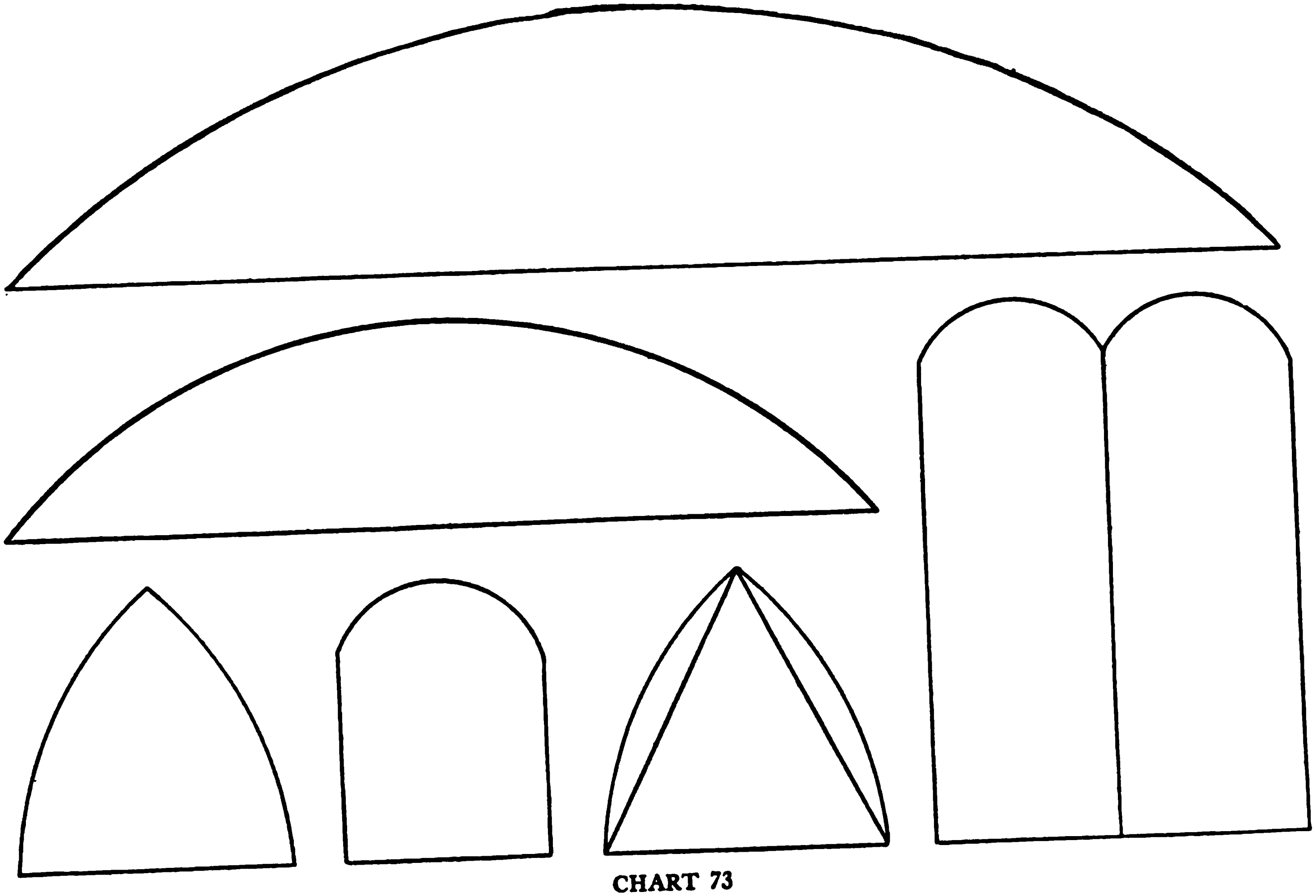

CHART 73

Six Colors and Five Mutual Complementaries

CHART 74

TRIADS

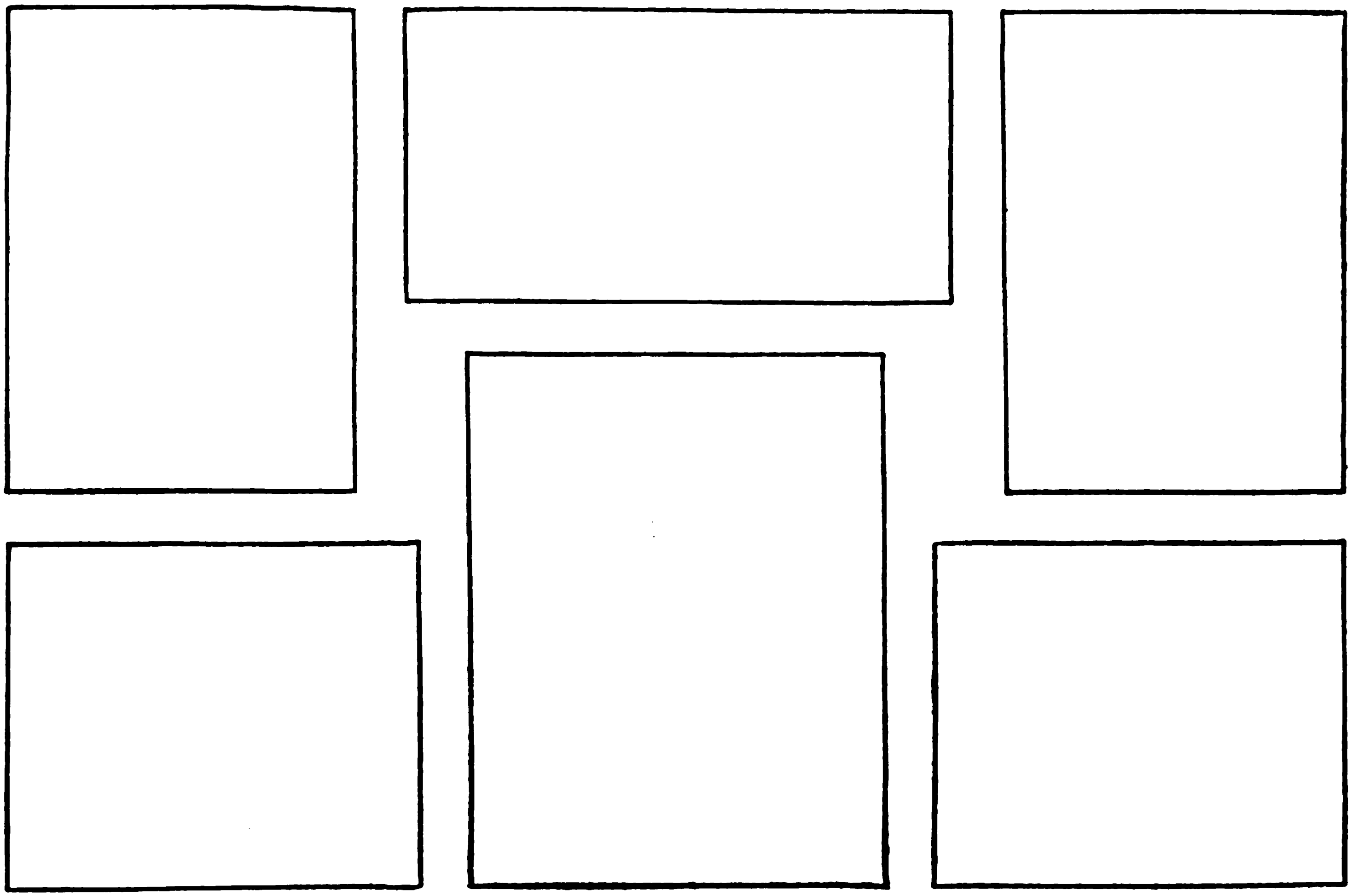

CHART 75

Monochromes in Red

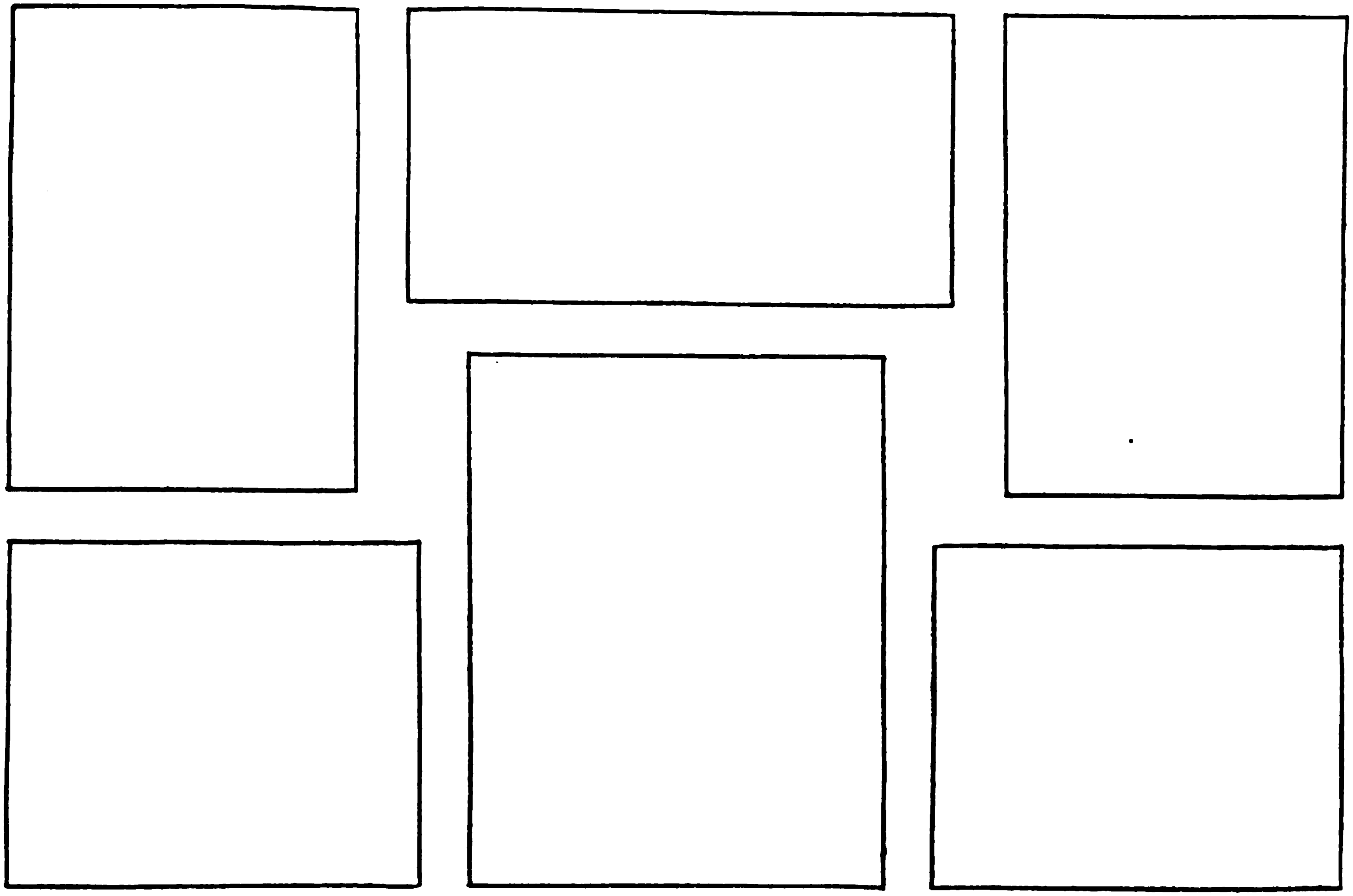

CHART 76

Monochromes in Orange

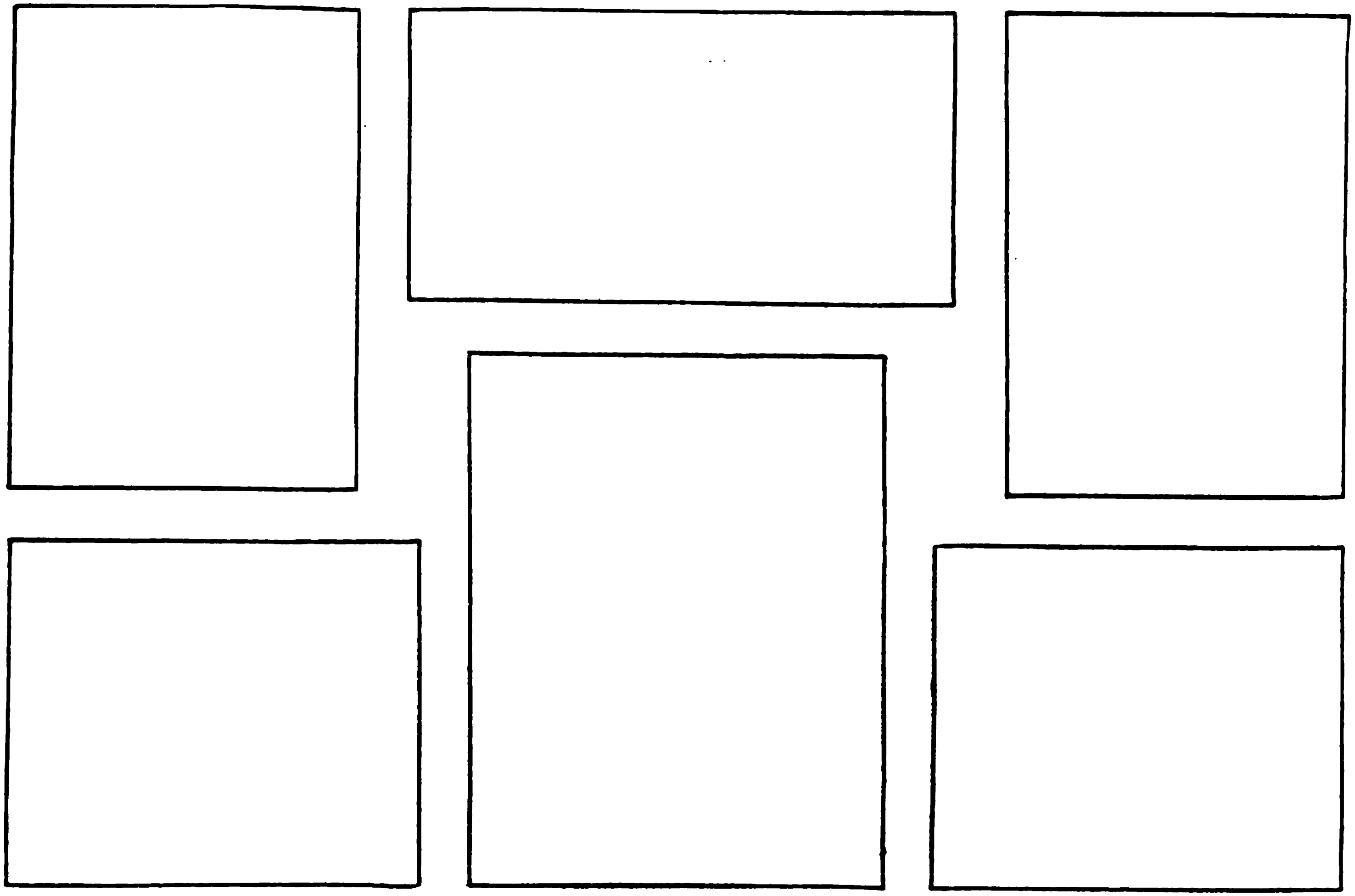

CHART 77

Monochromes in Yellow

CHART 78
MONOCHROMES IN YELLOWGREEN

CHART 79
Monochromes in Green

CHART 80
MONOCHROMES IN BLUEGREEN

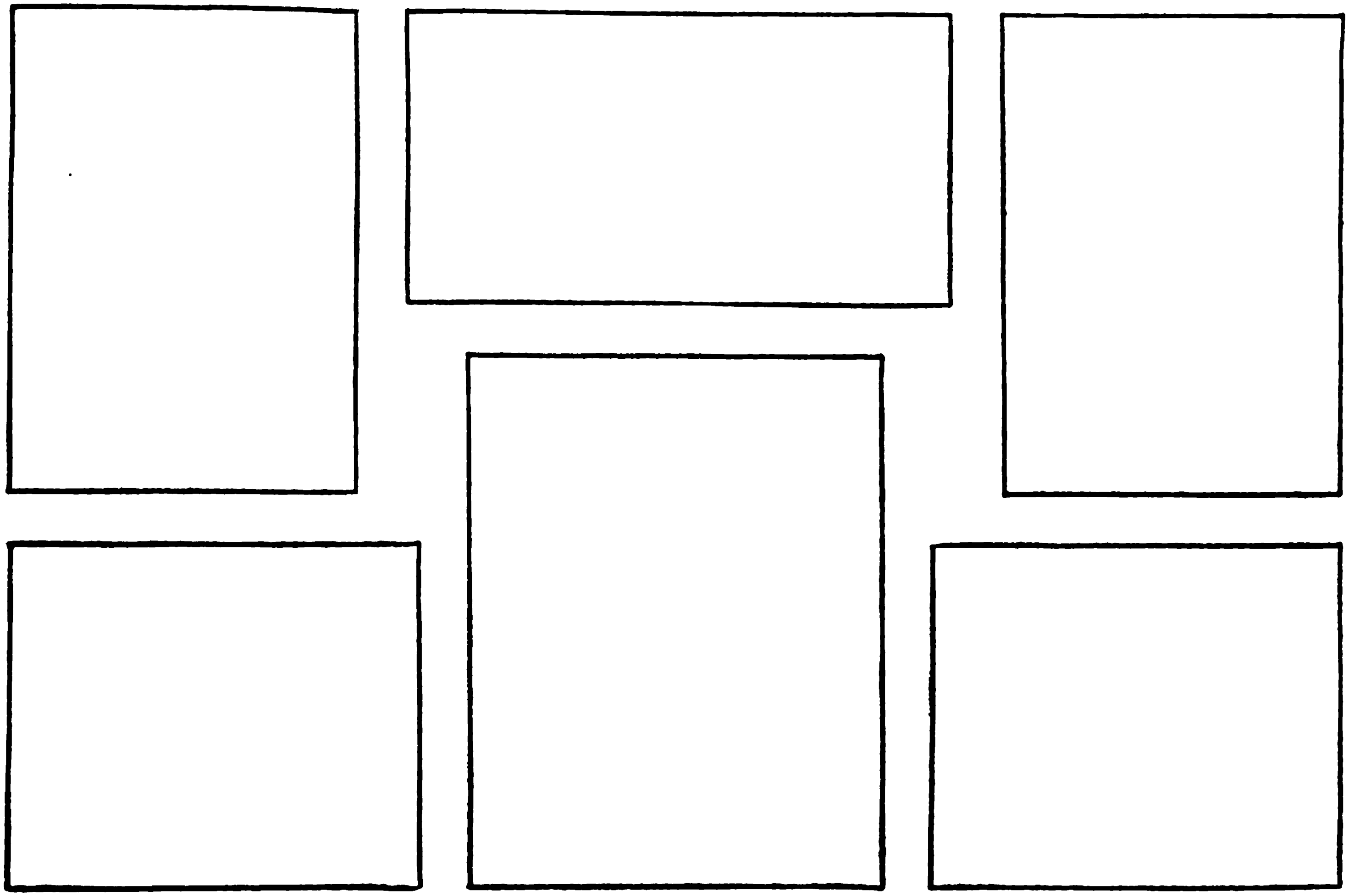

**CHART 81**
Monochromes in Blue

CHART 82

MONOCHROMES IN BLUEVIOLET

CHART 83

MONOCHROMES IN VIOLET

CHART 84

MONOCHROMES IN PURPLE

CHART 85
MONOCHROMES IN CRIMSON

**CHART 86**

MONOCHROMES IN SCARLET